Telephone Engineer

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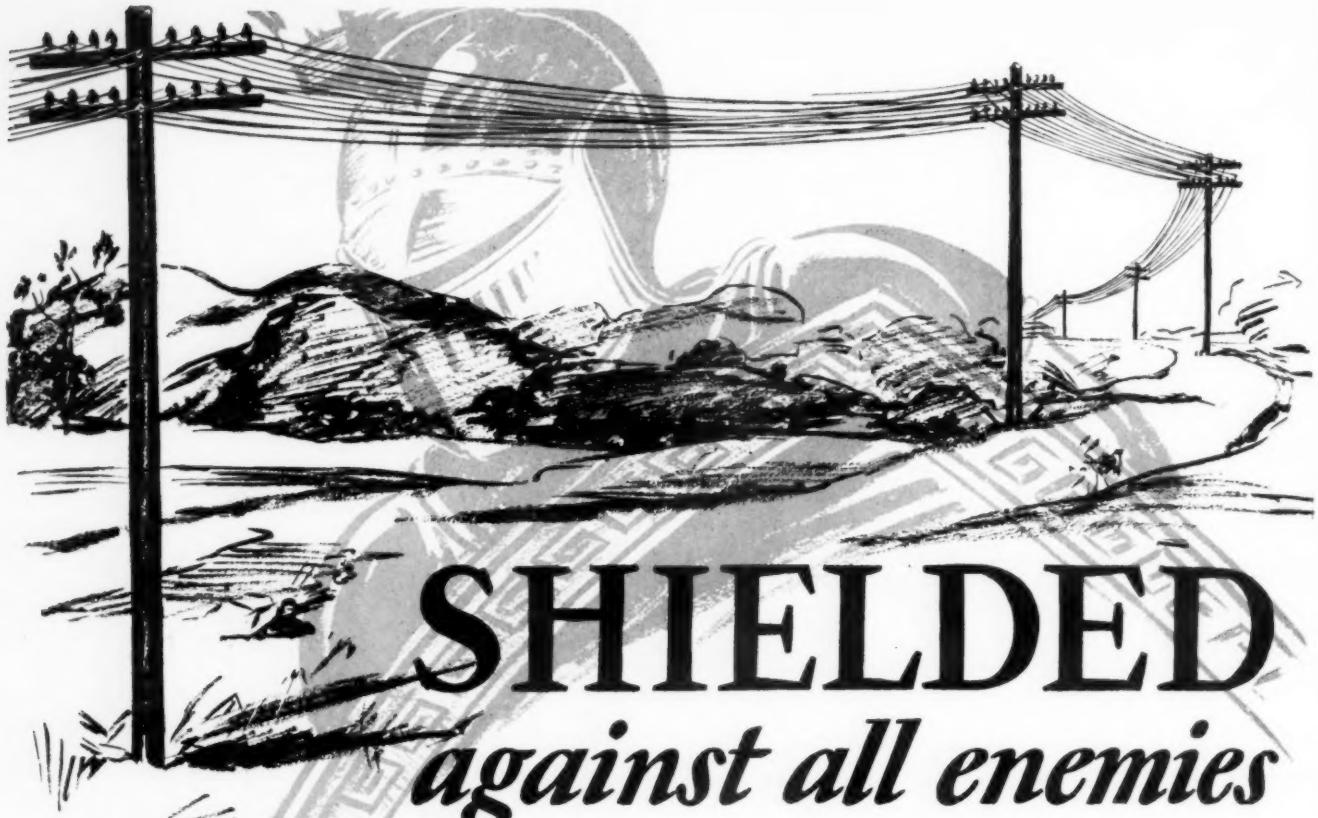

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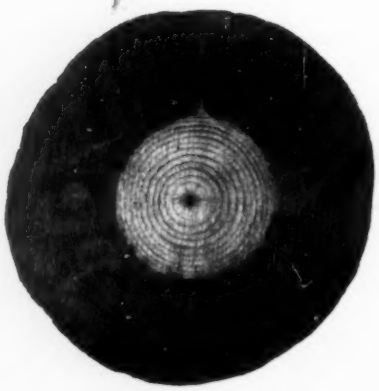

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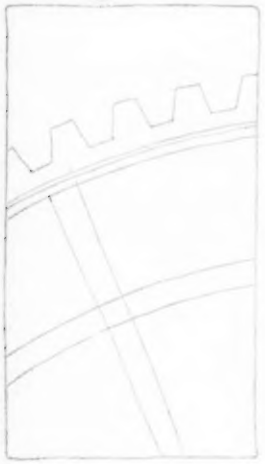
in Modern Telephony



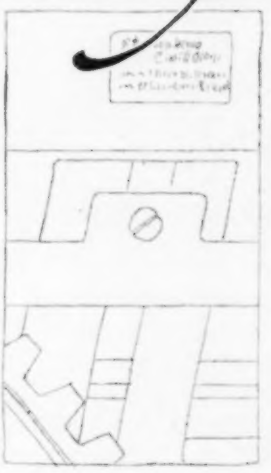


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Table of Contents

Editorial 15-16
Customers Ask Increase for Local Company—Are Employes Competent? Give Us Your Views—Signs Should Be Displayed by All Companies—Reduction Charges of A. T. & T. of Real Importance.
Coil Loaded Lines—By F. J. Dommerque 17-18-19
Practical Suggestions for Plant Valuation—By Chas. W. McKay 20-21
L. W. Scherer, Former Banker, Oklahoma Telephone Man 21
Studying Telephone Methods—By E. R. Collins 22-23-26
Converting Manual Central Battery Telephones for Automatic Operation—By E. O. Walker 27-28-29
Annual Northern White Cedar Convention Shows Record Year for Activities 30
St. Paul Capitalists Buy Control of Tri-State Company 30
Line and Desk 31
Commercial Activities—By H. F. McCullas 32-33
W. L. Jacoby, Kellogg's President, Featured in December Sales Management 34
Frank L. Eldridge to Manage Carbon Products Co. Chicago Office 35
Nebraskans Discuss Many Subjects at Annual Convention at Huron 35-36
Recent Bridge Construction at Portsmouth, Ohio—By C. W. Kugelman 38-39
Healthy Progress Made by British Telephone Services in 1927 41

Index to Advertisers

Addressograph Co. 43
Automatic Electric Co. 1-47
American Electric Co., Inc. 2-24-25-46
American Steel & Wire Co. 4
American Telephone & Telegraph Co. 42
Bernz Co. 44
Blake Signal & Mfg. Co. 44
Bowdle Accounting System 45
Buckeye Telephone & Supply Co. 43
Chapman, P. W., & Co. 36
Chicago Solder Co. 40
Contact Metals Co. 43
Cook Electric Co. 14
Copperweld Steel Co. 46
Electric Storage Battery Co. 10
Empire Hotel 41
Forged Steel Products Co. 46
French Battery Co. ..... —
Graybar Elec. Co. 13
Herdrich & Boggs 43
Holtzer-Cabot Electric Co. 12
Hotel Cass 46
Hotel Eltel 40
Hotel Fort Shelby 12
Indiana Steel & Wire Co. 12
International Creo. & Con. Co. 48
A. J. Johnson Elec. Co., Inc. 44
Johnson, J. K. 43
Kearney Corp., Jas. R. 41
Kellogg Switchboard & Supply Co. 6-7
Matthews Corp., W. N. 37
McKay, Chas. W. 43
Minnesota Electric Co. 43
National Cable Compound Co. 10
National Carbon Co. 11
Premier Electric Co. 44
Prest-O-Lite Co., Inc. 13
Rebuilt Electric Equipment Co. 43
Reliable Electric Co. 5
Runzel-Lenz Electric Mfg. Co. ..... —
Signal Eng. & Mfg. Co. 12
Standard Underground Cable Co. 44
Stewart Bros. 44
Stromberg-Carlson Tel. Mfg. Co. 8-9
Suttle Equipment Co. 43
Texas Creosoting Co. 2
Universal Specialty Co. 43
Unique Mfg. Co. 40
Wall, P., Mfg. Supply Co. 10
Welker, J. H. 43
Weston Electrical Instrument Co. 46
Wray & Co., J. G. 43

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Telephone Engineer

Volume 32 FEBRUARY, 1928 No. 2

Customers Ask Increase for Local Company

News reports bring the story of rather an odd situation in which the Nebraska Railroad Commission recently found itself. It seems that a growing and ambitious young city in the state decided that it had outgrown the magneto type of service and dispatched a committee consisting of the mayor and two citizens to visit the commission and request an immediate increase of rates for the telephone company so that the latter could install common battery service.

The proceeding was so unusual that the commission seemed to be at a loss to know how to act. Its suggestion that a hearing be held and an order written did not meet with favor on the part of the committee which desired immediate action. Finally the commission after getting into touch with telephone company officials and finding that they would agree to the change, decided to issue the order at once, subject to the condition that a hearing would be held if objections were made.

Not every community has enough leadership to propose and get an increase in rates for its utilities because it sees in the increase the source of an improved service. Almost any community, however, can be sold the idea of an increase if it is convinced that it will get more and better service. Where rate increases have met opposition, the community usually is of the mind that it is to pay more for the same old service, given over the same old plant in the same old way. The moral of the tale seems to be to sell the public an improved service at an increased rate. Commissions are seldom strong objectors if the public is satisfied.

* * *

Are Employees Competent? Give Us Your Views

Rather an animated discussion has been taking place in the Line and Desk department of this journal relative to the competency of the men who work in the telephone plant. The cause seems to have been the remarks of a speaker at a state convention who complained that it is almost impossible to get men who know anything about the work. A correspondent comes to defense of the men and asks how many of us really know what we are about. He gives his idea that the difficulty lies with the scarcity of reliable technical information. Another correspondent in the present issue admits that most of us are far from knowing all about our own business, but asks "why tell about it."

Taking advantage of editorial privilege we are adding our comment to the symposium. In our years in the telephone business we have made the acquaintance of quite a large number of telephone men in positions ranging from office boys and ground men to superintendents and executives. It has always seemed to us that telephone men in all departments of the industry measure up pretty well with men in other industries. Every business has its successful men and its incompetents and it is only normal to find men of each of these classes as well as all grades between them in the telephone industry.

Some of the outstanding men we have met are among the most modest in their appraisement of their own accomplishments. They have learned enough to realize that the telephone field is too large and the work to be done in it is too varied for one individual ever to acquire a knowledge of it all.

At the other end of the scale are the incompetents and those who at best have made only slight success in their work. There are some who are so hopelessly deficient in natural aptitude or are so lacking in ability to get on with their fellow workers or are so downright lazy that they are of no value to themselves or to their employers. There is another class—and we believe a larger one—whose seeming lack of capacity is due to the fact that they are placed in branches of the work for which they are not fitted or who have not been properly instructed and trained in the work that is expected of them.

Still another class seems to lack ability because they have never been given a chance to show it. Their work has been directed even to the smallest

details and whatever initiative and inclination to accept responsibility they may have is never given an opportunity to show itself. Some of these men show a surprising amount of ability when a job within their powers is put up to them without too many restrictions as to how it should be done. Likewise their powers expand rapidly as they pass from the completion of one job to the next.

We see no cause for pessimism as to the quality of men who are engaged in telephone work or of the men who will be coming into it from time to time. The inherently interesting nature of the work and its opportunities will draw to it men of the necessary ability to carry it on. Given intelligent supervision and sufficient training, they may be depended upon to do the work and solve the problems of the industry as they arise.

* * *

Signs Should Be Displayed by All Companies

In a very interesting address before the South Dakota telephone convention, Mr. J. H. Agee, General Manager of the Lincoln Telephone & Telegraph Co., among other things expressed the idea that telephone companies fail to advertise their buildings by having signs which are adequate to direct the stranger to the exchange. How well this criticism is merited is evident to anyone who has had occasion to find the telephone exchange in almost any small or moderate sized town.

In the smaller places, it is the usual custom for the stranger to go to the telephone office to make toll calls. Habit and the lack of adequate pay-station facilities in public places will continue the practice for a long time in the future. In the days of open wire and aerial cable construction the line of poles on the main street provided landmarks necessary to locate the office, but extensive use of underground construction and the relegation of lines to alleys and rear of properties have removed the landmarks. The sole remaining method of locating the exchange is to inquire of passers-by.

Objection may be made to the unsightliness of signs, but offset against this is their usefulness. After all, a small, well designed sign painted in attractive colors does not detract much from the appearance of the average American town or small city, and such a sign may easily be a boon to the stranger who is trying to locate the office so that he may place his long distance call.

* * *

Reduction Charge of A. T. & T. of Real Importance

The reduction of the charge made by the American Telephone & Telegraph Co. to its associated companies from four to two per cent of their gross revenue is a change of some importance in the telephone field. Accompanying the reduction is the plan for the Bell companies to purchase outright transmitters, receivers and induction coils which, since the formation of the Bell organization immediately following the invention of the telephone, have been owned by the parent company.

When the license charge was reduced from four and one-half percent to four percent about two years ago, we took occasion to comment at some length upon the change and much of what we said at that time is applicable to the present reduction. Incidentally, it is interesting to note that our former comment foreshadowed the present change and suggested the possibility of further reductions, together with the change of policy in respect to ownership of instruments.

Contrary to common opinion, the license revenue is not one of the most important sources of income of the parent company and its reduction by one-half when the expense of owning and maintaining the instruments is removed will not affect the earnings of the A. T. & T. Co. to any appreciable extent. Neither is it likely to make any great difference in the operating results of the associated companies. It will, however, remove the necessity of much special accounting that was formerly required because of the divided ownership of the subscriber's instrument.

The general legal, accounting, engineering and financial services will continue to be rendered and it is doubtful if any more specific or equitable plan can be found to reimburse the parent company than the one of charging a percentage of the gross revenue of the operating company. The method has been found to be applicable not only to the Bell System but among some of the telephone associations and some of the group organizations that have been formed among Independent companies.

Bell operating company officials, even those of companies not entirely controlled through stock ownership, have always insisted strongly that the benefits to the operating companies under the four and one-half percent contract were greater than the cost to their companies. It is probable that they will be all the more favorable to the two percent contract. This leads us to remark that Independent companies could have something of the same service from their associations if they could be brought to see that the benefits would outweigh the cost. The character and extent of the service, of course, would not be the same as in the Bell organization, but the cost would be much less than two percent of the gross revenue.

Coil Loaded Lines

By F. J. DOMMERQUE
Fellow A. I. E. E.

Definitions

Oliver Heaviside in England had evolved by his mathematical investigations of electrical phenomena a theory by which the distance of telephonic transmission of speech could be greatly increased; he proposed to build lines having a high inductance. Unfortunately he did not conceive a practical way how to construct such a line. Upon his suggestion experiments were made in England as far back as 1893 in which inductance coils with or without iron cores were inserted in the line in series at periodically recurring points. But they did not work. It remained for Professor Pupin to show a practical way out of the difficulty. His mathematical investigation showed him that the distribution of inductance coils could be made to increase the distance over which conversation can be carried as effectively as it could be done by increasing the size of the conductor, if the distortion of the transmitted waves, which was caused by the upper harmonics being more vigorously attenuated than the lower frequencies, could be avoided or made less detrimental. The solution of the problem to obtain the best transmission over a line resolves itself, therefore, into the problem of finding that particular value of inductance for a given resistance, capacity and leakance of the line which renders the attenuation constant $\propto$ a minimum. By the way it may be interesting to note that the designation of the attenuation constant by the Greek letter β was originated by Pupin and adopted by the continental European engineers. However we will follow the custom adopted by American engineers to designate the attenuation constant by $\propto$ and the wavelength constant by β.

It is a well known fact now that telephonic transmission is wave transmission when the distance from the transmitting end to the receiving end of the line is long enough to permit the development of electric waves, which is the case on long lines. These electric or electromagnetic waves of telephonic frequencies measure anything from 1/16 to 30 miles, or to use the metric system, which is always used by physicists in their work, from 1/10 to 50 kilometers. The "wavelength" is found by dividing the velocity of the waves in meters by the frequency of vibrations in cycles per second. The radio amateurs are familiar with the meaning of wavelengths, although not many will know their theory. The wavelength is the one of the characteristic constants of wave propagation, the attenuation constant being the other. It is in some way unfortunate that we have in our practical life adhered to the footrule and the pound, while in scientific work, particularly in physics, we have adopted the C. G. S. system. The consequence is that in calculations of the scientific kind, as they occur frequently in engineering problems, we have to transform from the duodecimal to the decimal system; that is, from miles to kilometers, from inches to centimeter, from pounds to kilograms and vice versa. In this country one forms the habit, and feels contented; but a student who has had to make calculations where the metric system was the universal system in industry and commerce will never return voluntarily to a mixed system, where he has to transform back and forth. However, this is immaterial to our discussion, it is only mentioned because we have to switch the reader frequently from our system of measurements to the metric system.

Returning again to the propagation constant, we know that in telephone lines, where the inductance L multiplied by 2π times the frequency; that is, where ωL is large in comparison to the resistance R and the capacity C multiplied by 2π times the frequency or ωC is large in comparison to the leakance G, the attenuation constant is

$$\propto = \frac{R}{2}\sqrt{\frac{C}{L}} + \frac{G}{2}\sqrt{\frac{L}{C}};$$

it can be found mathematically that $\propto$ becomes a minimum when $L = \frac{RC}{G}$. For inductances smaller than $\frac{RC}{G}$ the attenuation constant will increase. When

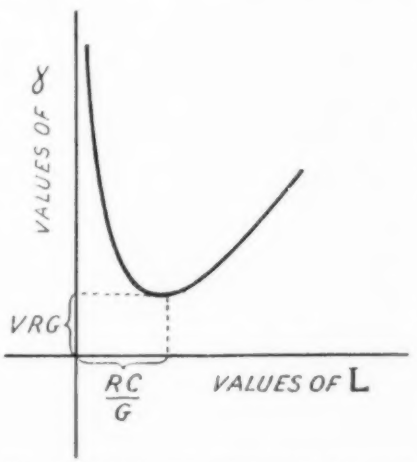

Fig. 1 Relation of Attenuation Constant $\propto$ to Inductance L

the inductance becomes zero the attenuation constant becomes infinite; $\frac{RC}{G}$ being the value of L which makes $\propto$ a minimum, the attenuation constant grows also to an infinite value when the inductance grows above $\frac{RC}{G}$; this relation is graphically shown in Fig. 1 where the values of $\propto$ are plotted for different values of L. The two branches of the curve grow to infinity. Substituting the value of L, which makes $\propto$ a minimum into the above equation gives

$$\propto = \frac{R}{2}\sqrt{\frac{CG}{RC}} + \frac{G}{2}\sqrt{\frac{RC}{CG}} = \frac{\sqrt{RG}}{2} + \frac{\sqrt{RG}}{2} = \sqrt{RG}.$$

This equation shows that the part of attenuation caused by the effective resistance and the part caused by the effective leakance become equal for the most favorable value of inductance; the capacity is then fully balanced by the inductance. Taking as an illustration a line of No. 12 N. B. S. gage hard drawn copper wire having a resistance R = 6.24 ohms per loop kilometer; assuming the leakance as 1 micrombo per loop kilometer, the equation $\propto = \sqrt{RG}$ would give $\propto = \sqrt{6.24 \times 10^{-6}} = 0.0025$ per km. But this would be under the assumption that the inductance balances the capacity or with other words that $L = \frac{RC}{G}$. With a leakance of 1 micromho per kilometer and a capacity of 0.005 microfarads per loop kilometer $\frac{RC}{G} = \frac{6.24 \times 0.005 \times 10^{-6}}{1 \times 10^{-6}} = 0.0312$, which is more than ten times what L would be in a No. 12 copper line, L must therefore be increased in value, which means the line must be "loaded." If L was loaded to 0.0312 henrys the distance l over which good transmission could be accomplished would be $\frac{2.5}{\propto} = 1{,}000$ km., taking $\propto l = 2.5$ as the normal standard. The question arises how can the line be loaded to 0.0312 henrys. The loading must be so as to retain the uniformity of the conductor; the insertion of loading coils would destroy the uniformity. Therefore a way must be found to place the coils, or rather to place only such coils in the line or only such a number of them, as to obtain at least approximately the effect of uniformly distributed inductance along

the line. Before we discuss this problem we will briefly explain the equivalence between uniform and non-uniform lines.

Equivalence Between Uniform and Non-Uniform Lines

When the electrical constants of a conductor, namely resistance, inductance, leakance and capacity remain practically the same at all points along the line, the conductor may be considered uniform. When, however, at certain points impedances are introduced in series, such as loading coils, or capacities in derivation, such as leaks, or both, the conductor becomes non-uniform. A metallic telephone line can be looked at as, and in reality is, a pair of conductors or also a twin conductor.

Professor Pupin in expanding his theory of non-uniform conductors has arrived at the following conclusion: *"For any given frequency a non-uniform conductor is equivalent to its corresponding uniform conductor as nearly as* $\sin \frac{\Phi}{2}$ *is to* $\frac{\Phi}{2}$." The angle Φ is the "angular distance" between the loading points, and is characterized by the relation $\frac{\Phi}{2\pi} = \frac{1}{\lambda}$, where 2π is the angular distance corresponding to the wavelength, where λ is the wavelength to be transmitted over the conductor and l the distance between two consecutive loading points.

The reader is referred to the TELEPHONE ENGINEER of September, 1926, where on page 25 a table of trigonometric functions is given. From this table he can read the values of sines and the corresponding values of the angles in radians and thus make comparisons. For sake of illustration we will pick out four values and show on them how the degree of equivalency of a non-uniform conductor to its corresponding uniform conductor can be measured by the per cent difference between the arcs and the sines of angles.

$90° = 1.5708$ radians; $\sin 90° = 1$; difference = 57 per cent.

$60° = 1.0472$ radians; $\sin 60° = 0.866$; difference = 21 per cent.

$30° = 0.5236$ radians; $\sin 30° = 0.5$: difference = 2.36 per cent.

$15° = 0.2618$ radians; $\sin 15° = 0.2588$; difference = 0.3 per cent.

This shows that the smaller the angular distance the more approaches the non-uniform line the corresponding uniform line for any given frequency, although not in simple proportion.

In spacing loading coils the inductance lumped at different points of the line has practically the same effect on the attenuation as uniformly distributed inductance if the inductance coils are spaced so as to form a fraction of the wavelength of the alternating currents to be sent over the line.

To space the coils properly is quite a problem, when taking in consideration the reflection losses which occur at the ends of the loaded line and which are caused by the difference in the characteristic impedance of the type of lines joined together and the construction of the terminal apparatus. Formulae have been developed, to calculate these reflection losses, but at the same time such progress has been made in construction of cables and otherwise that nowadays reflection losses are hardly noticeable. To take care of reflection it is essential to arrange the loading so as to have the characteristic impedance on the different types of the circuit sections the same and space the loading coils in the various sections so as to obtain the same relative electrical conditions in the sections.

Natural Pulsation and Cut-Off Frequency

Originally the rule followed in American practice for loading was that the electric wave propagating along the line must encounter at least 7,000 coils per second. In European countries the rules varied from the American rule. England and France had chosen as fundamental basis for the determination of the minimum number of coils per wavelength the formula $C L_c l \leqq A$, wherein C expresses the capacity per unit distance; L_c the total inductance of a coil; l the distance between two coils, and A a number, which was fixed as follows:

When the capacity per mile in microfarads, the inductance of a coil in millihenrys, the distance between coils in miles is inserted in above formula, the number of coils should be so as to make $C L_c l \leqq 25$. This formula would answer just as well if the kilometer were substituted for the mile unit. In the formula, however, the line inductance is neglected considering that same is extremely small in comparison to the inductance of the coils. German practice chose as fundamental basis of loading the "natural pulsation," that is the pulsation of the free oscillations of any element of the loaded line. Each coil forms with one-half of the adjacent sections of the line between any two coils an oscillating system or circuit, whose inductance is L_1 and whose capacity is $\frac{Cl}{4}$, always taking account of the fact that the capacities of the two sections are placed in series. The natural pulsation, designated by ω_o, of such a system is determined by the equation $\omega_o \sqrt{L_1 \frac{Cl}{4}} = 1$. The natural pulsation ω_o should be at least 16,000; thus (taking into account that $L_1 = L_c l$), $16{,}000 \sqrt{L_c l \frac{Cl}{4}} \leqq 1$, whence $8{,}000\, l \leqq \frac{1}{\sqrt{L_c C}}$ was the German rule.

The American rule for determining the number of coils can be expressed in the form $7{,}000\, l \leqq \frac{1}{\sqrt{L_c C}}$, because the length of a wave propagating along a line with high inductance is $\lambda = \frac{2\pi}{\omega \sqrt{CL}}$, and ω the pulsation of the currents under consideration. The relation between l and λ is given by the equation $\frac{\Phi}{2\pi} = \frac{1}{\lambda}$, where Φ is the angular distance between two consecutive coils.

Expressing the English formula in the same way, we obtain $C \times 10^6 \times l \times L_c \times 10^3 \times l \leqq 25$ or $6325\, l \leqq \frac{1}{\sqrt{L_c C}}$. From these three formulae it is evident that considerable differences existed in the four countries. Where American practice took the minimum number of coils encountered by the wavefront as 7,000, England and France took 6,325, while Germany took 8,000. The relative number of coils used in the different countries would stand as follows: Germany, 100; America, 87.5; England and France, 79. The maximum value of A in the formula $C L_c l \leqq A$ would be for Germany, 15.6; for America, 20.4, and for England and France, 25.

The value of the natural pulsation would be for Germany $\omega_o \leqq 16{,}000$; for America, $\omega_o \leqq 14{,}000$, and for England and France, $\omega_o \leqq 12{,}650$.

The above formulae specify the minimum but not the actual number of coils to be used.

Every line loaded with inductance coils has a so-called "cut-off frequency." This frequency is the one at which the attenuation of the line becomes so high, that the line is practically made impassable for alternating currents. Designating this cut-off frequency by f_c, its value for a coil loaded line becomes

$$f_c = \frac{\omega_o}{2\pi} = \frac{1}{\pi s \sqrt{LC}}.$$

A line which is not loaded may be considered as a smooth line, while a line loaded with inductance coils at intervals may be considered as a line with "lumped" inductance. This lumping of inductance has the effect to cause wave reflections at the points where the coils are inserted.

In Fig. 2 two curves are shown, the upper one representing the relation between attenuation and frequency for a non-loaded No. 19 B. & S. G. cable and the lower one the attenuation-frequency relation for a loaded No. 19 cable. There is a heavy line drawn vertically at the point where the frequency reaches about 2,800 cycles per second. This line indicates the cut-off frequency and shows

how the attenuation practically becomes infinitely great at the point where the cut-off frequency line and the curve meet. It will also be noticed that the curve is practically horizontal from zero frequency to about 2,000 cycles and then commences to rise rapidly, at this point

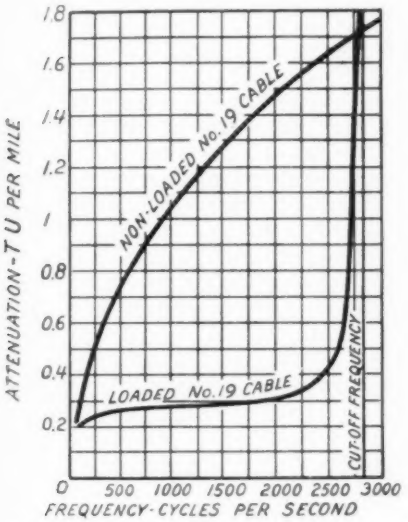

Fig. 2—Attenuation curves of loaded and non-loaded No. 19 B. & S. G. Cable.

the lumpiness begins to take effect. As will be seen this point is located about three-fourths, or 75 per cent, of the way to the cut-off frequency. Therefore it is not wise to load beyond this point. For many years American practice loaded for a cut-off frequency of $\frac{14,000}{2\pi} = 2,200$ cycles per second; the German practice was right from the start to use as cut-off frequency $\frac{20,000}{2\pi} = 3,200$ cycles per second. That the German engineers were the wiser will appear when we take up repeatered lines some other time.

Characteristic Impedance

In all transmission problems the characteristic impedance is a most important factor. Sometimes the characteristic impedance is called the sending-end impedance and sometimes the line impedance, but characteristic impedance is the most proper designation. It may be defined as the impedance of an identical line of infinite length.

The value of the characteristic impedance of a line can be expressed in terms of the electric constants of the line, but the complete formula is rather complicated; it can, however, be simplified in the same manner as the complete expression of the attenuation constant was simplified, by taking cognizance of the fact that in loaded telephone lines the product ωL is large in comparison to R, which fact permits of reducing the complete value to an approximate form accurate enough for practical usage.

Designating the characteristic impedance of a line by Z_o, the formula becomes $Z_o = \sqrt{\frac{L}{C}}$, where L and C are the value of inductance and capacity respectively for unit length of line. As the best means to prevent reflection losses is to make the characteristic impedances in all sections of the line equal, it is easily understood why the characteristic impedance is so important.

In transmission calculations it is not only the line which is involved but also the terminal apparatus; therefore the impedance of the terminal apparatus must be known also. The terminal apparatus as a rule consists of the telephone instruments. For local battery telephones the impedance of the instrument, which will be designed by Z_r, would be 1,000 ohms. For a common battery telephone circuit No. 1 of the W. E. Co.'s type with a No. 25 repeating coil and supervisory relay, but with a zero line the impedance would be 418 ohms, and for the same circuit with a 300 ohm line the impedance would be 730 ohms.

Practical Hints

In America we first had three degrees of loading, heavy loading with about 0.2 henrys per mile, and with a spacing between coils of about 1¼ miles; medium loading with about 0.1 henrys per mile and 1¾ mile coil spacing; light loading with 0.05 henrys per mile and 2½ mile coil spacing. All three kinds of loading were in use on cables. As a rule open wire lines were heavily loaded only, as their circuits were so much longer than cable circuits. As a general proposition in loading lines, the choice between heavy and light loading is influenced by various factors. An increase in loading means an increase in energy transmitted; at the same time increased energy brings about an increase in the inductance and also makes the losses by poor insulation more distinct. Consequently it is more difficult to balance the circuits with heavy than with light loading.

The distortion, which is the dangerous part in efficient speech transmission, is more apt to be noticed in heavy than in light loaded lines. Consequently for not too great a length of line medium or light loading is better.

To obtain this end in view either a small gage wire and more coils or a larger size wire and fewer coils may be employed. It is economical to load lightly for the same cost of copper and coils; this has favored cables with No. 16, No. 14 and No. 13 B. & S. gage conductors. As a general rule in the construction of loaded lines the use of intermediate stations should be avoided wherever possible, as they are liable to unbalance the system. Crosstalk appears much easier on loaded lines than on non-loaded lines; therefore much care must be used in transposing. In cables this is taken care of by twisting the wires of a pair symmetrically, and also the pairs themselves where "quad formation" is used. The cable splices must be made so as to counteract the capacity unbalance in opposite directions of a circuit in the section to be joined to it.

On aerial lines of open wire the transposition must be arranged so as to cut-in the loading coils at the transposition junctions and to use special insulators of porcelain or electrose for the bridle wires. The transposition of the line itself should be made with drop brackets and double petticoat porcelain insulators so that one wire is attached to the insulator on the upper side of the crossarm in the regular fashion, while the other wire is attached to the insulator carried by the drop bracket and thus passes underneath the crossarm. Double petticoat porcelain insulators are preferred as line insulators for loaded lines, a custom used in Europe everywhere, in fact to the Europeans a glass insulator is an unknown quantity.

To return once more to the amount of loading, it may be said that lighter loading is more advantageous in the various circuit combinations found where sections of different construction are joined to the loaded line and where the latter is not very long. Each case of loading must be considered under its own conditions. Recent practice has made changes in the weight of loading as a consequence of the introduction of the repeater, which will be reported when we have an opportunity to discuss repeatered lines at some future date.

A table is added which relates to a loaded cable of 0.04 m. f. capacity per kilometer as an illustration of various kinds of loading.

Kind of loading.	Coil inductances in henrys.	Distance between coils in km.	Additional inductances per km.	Values of CLcl.	Characteristic impedance in ohms.
Very light	0.050	9	0.007	21.6	410
Light	0.135	4	0.034	21.6	920
Medium	0.175	3	0.058	21	1200
Heavy	0.250	2.15	0.116	21.5	1700

The characteristic impedance follows the formula: Impedance $= \sqrt{\frac{L}{C}}$, where L = inductance per km. and C = capacity per km.

Happy Crawford Celebrates

C. L. Crawford, good-will ambassador for the Everstick Anchor Company, was celebrating his twenty-fourth year as salesman in the telephone field, at the Milwaukee convention February 7-9. Crawford began way back when the Lord knows where and when, but he claims it has been only twenty-four years, and has covered the states for Hubbard & Company, W. N. Matthews, and is now with the Everstick Anchor Company, with territory east of the Mississippi and north of the Ohio river. His former occupation was—well, let's talk about the weather.

Practical Suggestions for Plant Valuation

By CHARLES W. McKAY, M. E.*

CHAPTER VIII.

Now we come to the subject of discussing ways and means of determining the actual present condition of plant and equipment as found in the field at the date of appraisement.

Let us first consider the pole line accounts. It will be remembered that in the pole line inventory form, a space was provided for recording the actual observed condition of the property in terms of a percentage.

First considering the poles alone, without the cross arm, guying and other auxiliary equipment—many and devious methods have been devised for determining the actual present condition as of the inventory date. It should be remembered that we are not interested in the actual age of the poles. We are interested in the expected unexpired life—or, in other words, the present condition as found at the date of the inventory.

Many companies have prescribed very elaborate routines for determining present condition. In the writer's opinion, the simpler the method, the better. A certain amount of sap rot is bound to occur during the first year the pole is in the ground. This rot, if it is confined to the outer layer or sap rot does not exceed to a one-quarter to one-half an inch, is not to be expected and has no appreciable effect upon the life of the pole.

To maintain the plant in efficient condition through repairs and minor renewals paid from current income, Mr. Thomas believes, is a wise procedure. The final renewals are made as required, and the cost is debited to the renewal reserve account. When renewals are made and the reserve account is debited because of liability for future renewals, it is important that the expenditure therefore should be charged against "Renewal Reserve Account" and not against the year's operating expense, otherwise the reserve would be building up indefinitely. Mr. Thomas gives the following points, which should be kept constantly in mind in studying the problem of depreciation:

1. The renewal fund is set up for the purpose of spreading the cost of gradual renewal of plant units as uniformly as possible over the expectancy of life period, thus obviating unnecessary fluctuation in cost of operating, and so making it more practical to keep loss and gain balances as uniform as possible and preventing sharp fluctuations in dividends or losses.

"2. The amount to be so charged annually to loss and gain and credited to renewal-reserve account, is an estimate or assumption of the effective life of the unit, based upon past experience and future probable possibilities.

"3. The loss will not have to be met until replacement actually is made. Loss is an accruing liability resulting finally in a decrepitude depreciation not yet due. Therefore, if the year's share of the accruing liability is taken, and the payment is not yet due, it is held by some that the fund should receive the benefits of interest accumulated until the time for payment arrives.

"4. So far as the plant's capacity for rendering efficient service is concerned, it by no means follows that the plant has depreciated to the extent of the balance to the credit of the reserve. In fact, the contrary is nearly always the case."

The opinion is sometimes expressed that appraisals are of very limited application by the accountant. It is possible that this view has been caused by a lack of understanding and appreciation of the subject, and also by the fact that neither the owner nor the accountant—and possibly the appraiser—fully understand their value.

The significance of the foregoing may be made clearer to the reader by again referring to the illustration of a unit of plant having a $100.00 reproduction value; a ten-year life and a $10.00 salvage value. We have already seen how the accountant will handle the problem. He will determine the wearing value—$90.00—and set aside 10 per cent per annum—or in other words, $9.00 per annum, as an accretion to the reserve for depreciation. Now let us assume that the appraisal is being made five years after the initial installation of the plant unit in question. The accountant will have written off $9.00 a year for five years—or a total of $45.00. This subtracted from the replacement cost gives a present value, on an accounting basis, of $55.00. In other words, the unit in question is in 55 per cent condition at the time of appraisement—if we were to measure present value by accounting standards. However, we entirely disregard the accountant practice and make an actual inspection of the unit in question to determine its present useful condition. Despite the fact that the unit is five years old, we may find that it is in 75 per cent condition at the time of appraisement. In other words, the present value in dollars will be $75.00. Are these two methods inconsistent? The reader will readily see that they are not—when he stops to realize that during the next five years (the last five years of the useful life of the unit in question) depreciation may take effect at a much more rapid rate and that the entire $90.00 wearing value may have been exhausted at the end of the ten-year period.

The subject of depreciation may, therefore, be sub-divided into classifications:

(a) The determination of actual accrued depreciation—as found by inspection—for determining the true present worth of the plant.

(b) The provision of ways and means for building up a reserve fund adequate to replace plant after it has lived its useful life—in other words, after it has become worn out, or obsolete.

We will now consider the present value phase of our problem. For obvious reasons, the depreciation of public utility property differs radically from the depreciation of industrial property.

The writer realizes, fully, that the reader is not interested in detailed methods of finding sound values. However, as an illustration of the method pursued we will follow through a set of brief instructions for finding the present sound value of a typical public utility property—a telephone property.

As previously suggested, the present condition of the various component elements of a telephone property should be obtained at the time the inventory is recorded. The condition should be either recorded directly in per cent—or by a code system which represents a range of percentages. To illustrate in connection with poles—if the code system is used—the letter E may be used for poles in excellent condition; the letter G for poles in good condition; the letter F for poles in fair condition and the letter P for poles in poor condition. Expressed in terms of percentage, E would range from 100 per cent to 95 per cent condition; G from 95 per cent to 50 per cent condition; F from 50 per cent to 25 per cent

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condition, and P from 25 per cent to 0 per cent condition. We will consider briefly the proper method of determining the present condition per cent of the various component elements of a telephone property.

The writer realizes that the foregoing rather explicit explanation of the distinction between annual and accrued depreciation may be a little bit "dry reading," but it is most essential that any telephone executive who is contemplating a valuation of his own plant, should have these fundamentals clearly in mind before attempting to determine the accrued, or observed depreciation—in other words, before attempting to determine the present, or depreciated value of his property.

After allowing for sap rot, an experienced telephone man can readily determine the sub-surface condition of the pole by digging the ground away from the base and using the simple bar test. An experienced engineer or practical man can soon tell if sub-surface exterior rot has occurred: if "pockets" have been formed, on any side of the pole or if heart, or cone, rot has taken place.

With respect to the portion of the pole above ground, it should be remembered that a pole may be badly scarred by climbers without in any way affecting the condition of the pole. As a matter of fact, the writer has found many poles that presented a most disreputable appearance above ground and yet were perfectly sound. Of course if major strains have been imposed causing serious cracking or "checking"—this fact should be taken into consideration.

Some attention should be accorded to the roof conditions. If a pole has not been properly roofed, rot may set in at the top which will extend far down into the interior of the pole. In most cases, however, this is not serious and can be readily remedied by cutting off a short section of the top portion of the pole; reroofing it and properly treating or painting it.

Taking all of these various factors into consideration, and assuming that the average life of a pole is sixteen years (we use the life of sixteen years merely as an example—the actual average life may be longer or shorter, in various communities) if it is reasonable to suppose that the pole will last twelve years longer, it is 25 per cent gone (in other words four years of its useful life have expired) and the condition of per cent to be assigned will be in the ratio of 12 to 16—in other words, 75 per cent.

In the March issue we will continue the discussion of conditioning pole line equipment—taking up the subject of cross arms, anchors and guides.

L. W. Scherer, Former Banker, Oklahoma Telephone Man

L. W. Scherer

L. W. Scherer, of Yale, Okla., classifies as a constructive and highly efficient utility operative and executive. He is president and general manager of the United Telephone Corporation, owning and operating exchanges at Yale, Thomas, Custer City, Seiling and a group of eight exchanges in Blaine county including Watonga, Oklahoma; he is first vice-president of the Oklahoma Utilities Association, and is chairman of the telephone division of the association.

Mr. Scherer was born at Raymond, Ill., October 18, 1884, at which place he lived until eleven years of age, when he removed to Newton, Kans., where he received his grade and high school training, finishing his education in Kansas State University, at Lawrence, Kans. He is a son of farmer-stockman, his father, however, died when he was only ten years of age. After leaving the University of Kansas, he was employed several years with the National Bank of Commerce, Kansas City, Mo. On account of failing health, he was compelled to leave Kansas City, and spent two years "riding the range" in the Pecos Valley, New Mexico. It was in that state that his telephone education began, clearing trouble on the back of a cayuse. The telephone lines were largely the wires of barbed-wire fences, and much "trouble shooting" was necessary on account of cattle breaking through fences. Following he spent six years as a traveling salesman, selling groceries and produce, and later hats and caps. He married in 1913 and quit the road to accept a position with the First National Bank of Hutchinson, Kans., leaving that institution in 1914 to take charge of the Yale telephone exchange.

Mr. Scherer has completely rebuilt the Yale exchange at least twice, since taking charge there, and can now claim in that property of one of the best telephone plants in the Southwest. Mr. Scherer has a wife and two boys, Eugene Linn and James Donald. He is a member of Masonic orders, the Blue, Chapter, Commandery and Shrine lodges. He was president of the Yale Chamber of Commerce, and is at present a member of its board of directors. He is greatly interested and very active in radio work, and renders a highly satisfactory radio program service in his Yale exchange. He is secretary-treasurer of the American Program Association and a member of its board of directors. Since the organization of the United Telephone Corporation last fall, and the acquisition by the company of the Watonga telephone properties, he plans to remove his general office to Oklahoma City, at an early date. He has always been active in utility association work, and is regarded as one of the best utility executives in the state.

Mr. Scherer is a tireless worker in the interest of the telephone industry of Oklahoma, and for the welfare of the entire membership of the Oklahoma utility association. He is a universal favorite with all who know him. His friends are legion, not only in Oklahoma, but throughout central and southwestern states: Iowa, Illinois, Kansas, Missouri, Texas and New Mexico. He is a genial companion, but business to the core. He is conscientious, fair and square in his business dealings with all. He possesses a splendid personality, has marked aptitude for making and holding friends, and is distinguished for integrity, character and faithfulness to duty. Being at all times actively engaged in the improvement and advancement of the telephone and radio industries, in Oklahoma and the Southwest, he is peculiarly well-fitted for the work in which he is engaged. He can be justly proud of his record as a utility builder.

A New Direct Circuit for West Coast Cities

The cities of Seattle and Los Angeles are now connected by a new direct telephone circuit so that calls between the two cities are no longer routed by way of Portland and San Francisco. The distance traversed by the new circuit is 1,358 miles and constitutes the longest through circuit established on the west coast.

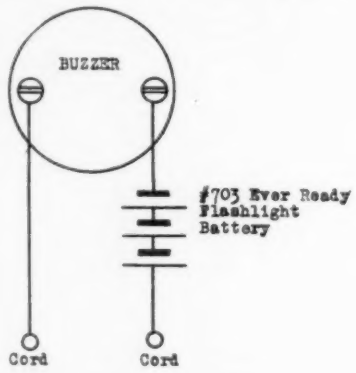
Studying Telephone Methods

By E. R. COLLINS
Manitoba Telephone System, Brandon, Canada

CHAPTER XIII

A good telephone man can usually be picked out by the condition of his tools. A poorly ground screw driver is a very destructive tool, both to furniture and to a man's temper. Give me a man who keeps his tools in good shape, and provides himself with suitable apparatus for testing, and we can accomplish some real work.

Possibly the simplest piece of testing apparatus is the ordinary buzzer and battery. It is indeed very aggravating to need a buzzer to test out a key circuit, for instance, only to find that Henry hasn't such a thing. A very convenient method of making up a buzzer is to get one of the wooden boxes that come with the Gillette Jumbo Safety Razor, and mount the battery and buzzer in it. A No. 703 Ever Ready or the corresponding size of any other make is plenty large enough for maintenance work. Place the battery inside the box, and mount the buzzer on the cover with a couple of half inch 6/36 machine screws. Connect the buzzer and battery with two pieces of



Ordinary Buzzer Test Circuit.

FIG. 92

tinsel cord, as shown in Fig. 92. Cords can be made up by using the conductors from an old operators' set cord. To the one cord solder a piece of No. 10 B. & S. bare copper wire, and grind the outer end to a point. To the other cord solder a suspender clip such as is used in a book store to hang papers in the window. The clip can be snapped to one terminal of the wire to be tested and the pointer will be found convenient to look for the other end, especially if it is in a key or relay. Fasten a loop of half-inch twill tape to the box so that it can be hung up on a relay rack or other place while testing.

If you wish to carry the buzzer around with you in your tool bag, the clip and pointer are apt to get in contact, and run the battery down. To overcome this equip the ends of the cord with two miniature plugs. These can be obtained from the Western Electric Co. and are known as No. 360 tools. A snapper clip, known as the No. 365 tool, will fit into these plugs, and a spade clip, known as the No. 364 tool, will also fit into the No. 360 plug. The pointer can easily be made up from a piece of wire to fit into the No. 360 tool. The clip and the pointer can be removed from the No. 360 tools, and there will be no danger of discharging the battery.

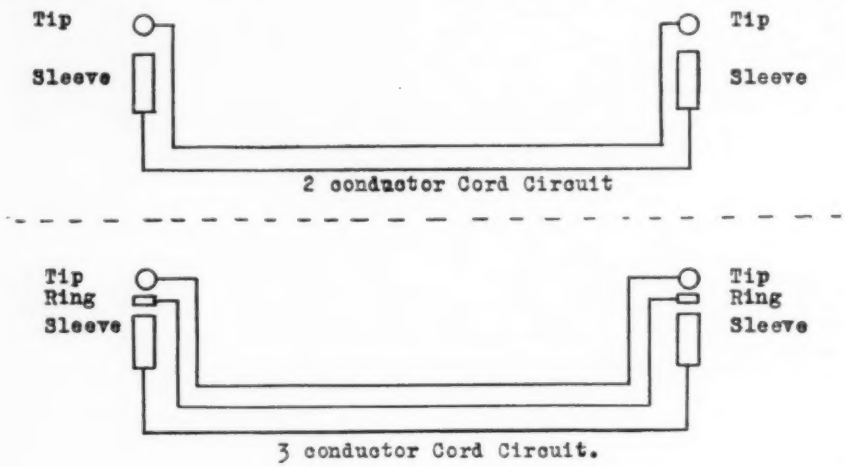


FIG. 93

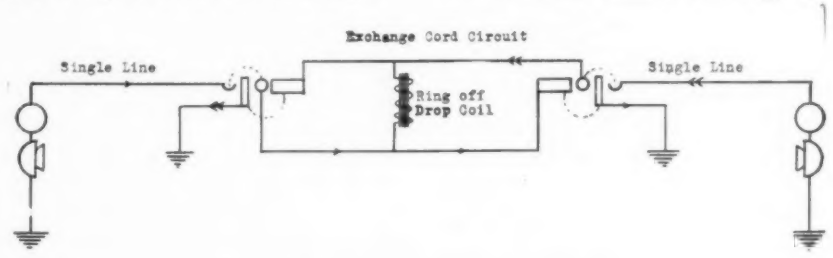
Connecting of Cords

To place a switchboard cord into a board is a very simple matter. There is, of course, a right way and a wrong way of doing it. In Fig. 93 is shown a two conductor cord and a three conductor cord circuit. For simplicity the keys are omitted. The two way cord has a two conductor plug. The two conductors are called the *tip* and *sleeve*, respectively. This is illustrated in the upper drawing of Fig. 93.

The three conductor cord has a three conductor plug whose conductor parts are called the tip, ring and sleeve. The tip and ring are used for the talking circuit, and the sleeve is used for operating lamp signals and other apparatus. In automatic telephone work, the tip is referred to as the "positive line" and the ring as the "negative line," and the sleeve as the "private" or "release trunk."

In Fig. 93 it will be noticed that the tip of the one cord is connected to the tip of the other cord of the same pair, while the sleeves of the two plugs are connected together. It occasionally happens that the tip of the calling cord is connected to the sleeve of the answering cord. For ordinary work this would not make any difference. We would simply say that one cord was reversed. Occasionally we find conditions that call for all cords being connected correctly.

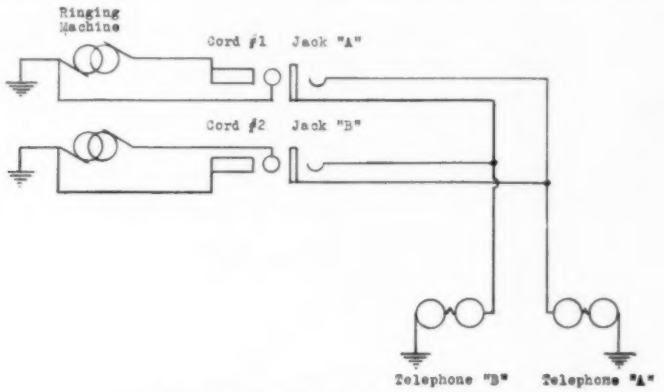
In Fig. 94 is shown a pair of cords at the telephone exchange connecting two single or grounded lines. The tip of one cord is connected to the sleeve of its mate. By following the single arrow from the left hand telephone we find that it goes to ground at the jack of the right hand line. Following the double arrows from the right hand telephone, we are taken to ground at the jack of the left hand line. It is quite obvious that there will not be any transfer of energy from



Showing effect of connecting cord incorrectly.

FIG.94

one telephone to the other, and if due to a high resistance ground at the exchange, any voice currents should flow from one line to the other, they would have to pass over the drop coil. This is of high impedance to voice currents. This is rather an unusual case, but the writer has encountered such a trouble.

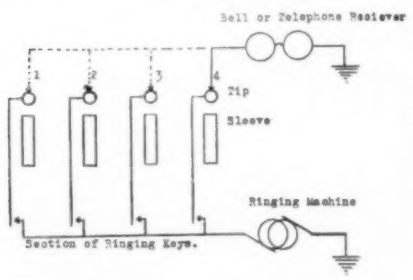


Effect of reversed cord on Party Line Ringing.

FIG. 95

Effect of Cord Connection on Ringing

Another example of incorrect connection of the tip and ring of a cord is shown in Fig. 95. Here we have a two party line known as a jack per station. The bell at station B is grounded from one side of the line while the bell at station A is connected to ground from the opposite side of the line. If cord No. 2 were inserted in jack B then ringing current from the grounded ringing machine will flow over the tip of No. 2 cord, the tip of jack B to bell at telephone B. If plug No. 2 were put into jack A the ringing current would flow over the tip of the No. 2 cord, tip of jack A to telephone A. This is correct. Now if we were to have used cord No. 1 we would ring telephone A from jack B and telephone B from jack A. In other words the cord No. 1 is reversed as far as ringing current is concerned.



Method of Testing Cords for correct connection to Ringing Machine.

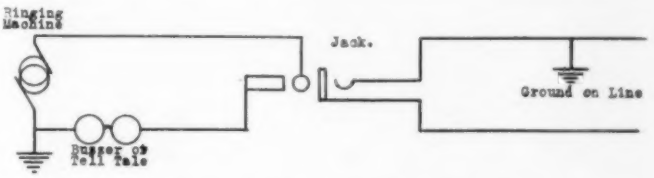
FIG. 96

Testing Cords for Proper Connection

In Fig. 96 is shown a simple method of checking over the cords for proper connection. The ringing machine in most exchanges is grounded on one side for party line ringing. Therefore, if we take an extension bell or a telephone receiver and connect to the tip of each cord in turn, while ringing with the ringing key, we should get a signal on the bell or receiver from the tip of each cord.

For simplicity we have only shown one side of the ringing key. Should the cord circuit be provided with a ringing key for the front cord, and also for the back cord, it is best to check both the front and back cords to see that they are connected correctly as shown in Fig. 96.

Now after the generator connection has been verified, and any reversals straightened out, use the buzzer test set and buzz from tip to tip, and from ring to ring, and also from sleeve to sleeve if necessary. The ringing test might be correct, but the circuit be reversed when tested with the buzzer from tip to tip. We will discuss this reversal later in this article.



Incorrect method of connecting Tell Tale.

FIG. 97

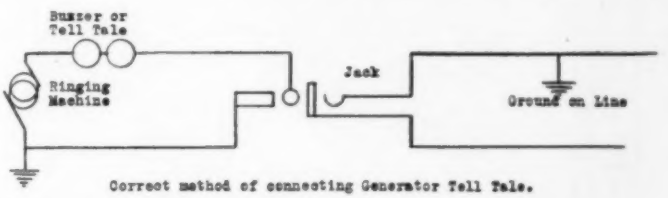
Connecting Buzzer or Tell Tale

It is customary on magneto boards to install a buzzer or tell tale in the generator circuit. This is to serve the purpose of a protecting resistance to prevent too much current flowing over a low resistance line. The usual buzzer resistance is 80 ohms. The other purpose is to give the operator an indication that the bell at the called telephone is being rung. Where the ringing machine is not grounded it matters little where the buzzer is connected in the circuit. Where the generator is grounded on one side, it is important to have it connected in the correct place in the ringing circuit.

In Fig. 97, the buzzer is connected in the grounded side of the generator circuit. If the operator were to ring on the line shown in Fig. 97, the generator current would flow from generator over the tip of the cord and line to the ground on the line. There would be no protecting resistance in this circuit, and there would be an excessive load put on the generator. The operator would have no indication that there was any current flow, and might continue the ring an unusually long time. The results would be bad.

In Fig. 98 is shown the correct method of connecting the tell-tale in the circuit. Here it will be seen that any current flow from the generator to ground will operate the tell-tale. The operator receives a signal, and the generator is protected.

Attention to these small details adds to the smooth working of any telephone exchange.



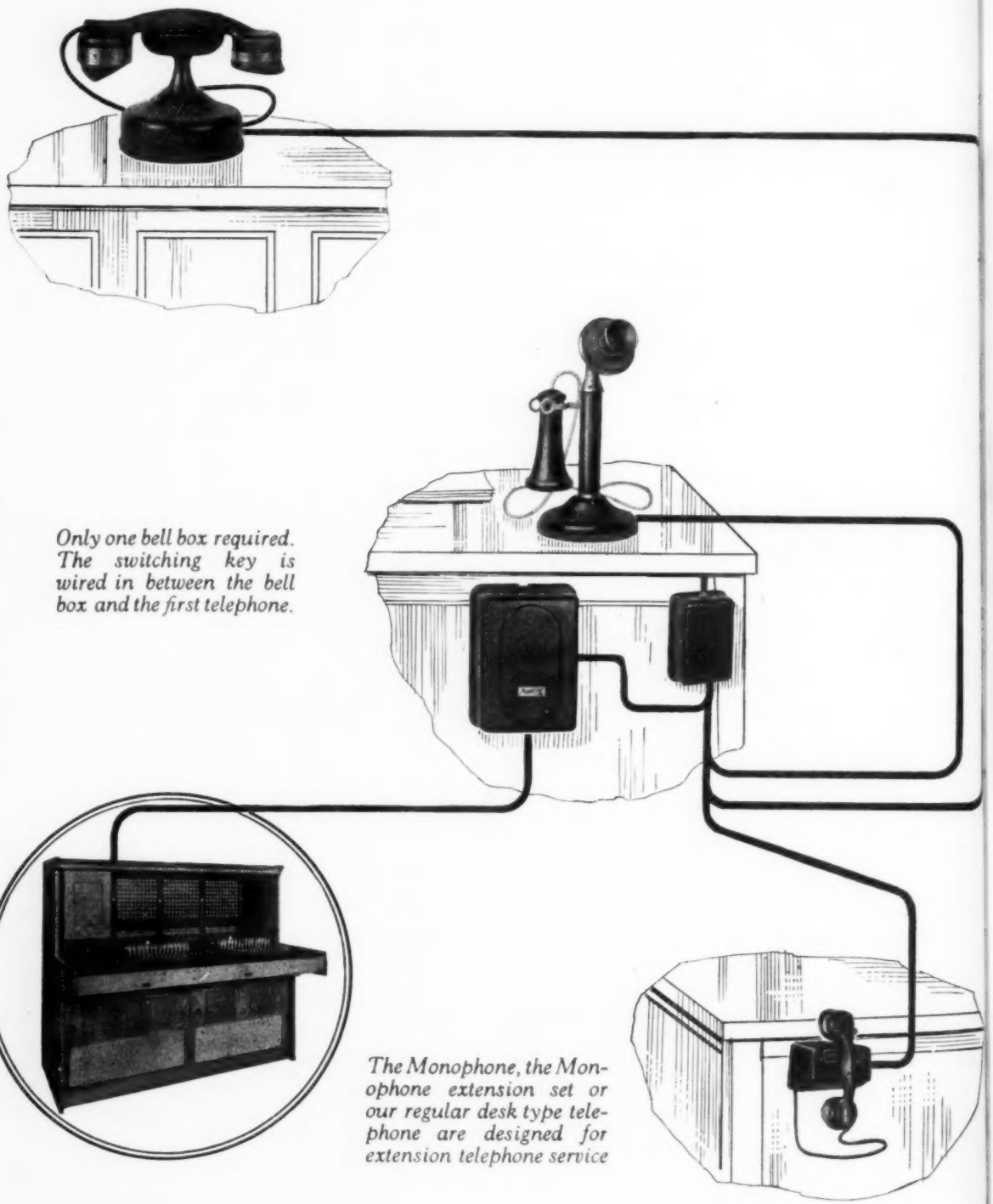
Correct method of connecting Generator Tell Tale.

FIG. 98

Switchboard Keys

Switchboard keys of any manufacture comprise a set of springs fitted with platinum or alloy contacts. These springs are mounted to a frame with insulating bushings. A cam with a handle for the operator to move, and a roller to move the springs, causes the springs to change their relation to one another.

In Fig. 99 is shown a group of three springs. This is commonly referred to as a *spring assembly*. Spring 1 is the make contact, while spring 3 is the break contact. The movable spring 2 is often referred to as the blade. The motion of the cam roller might be to the left, or straight down. In either case, spring 2 will be moved to the left. Now if spring 2 is moved to the left slightly spring 3 should follow it to the left, at least a distance equal to its own thickness. This follow up motion indicated that spring 2 is exerting a good pressure against spring 3. If there is no follow up there is sure



Only one bell box required. The switching key is wired in between the bell box and the first telephone.

The Monophone, the Monophone extension set or our regular desk type telephone are designed for extension telephone service

Increase Telephone Rentals

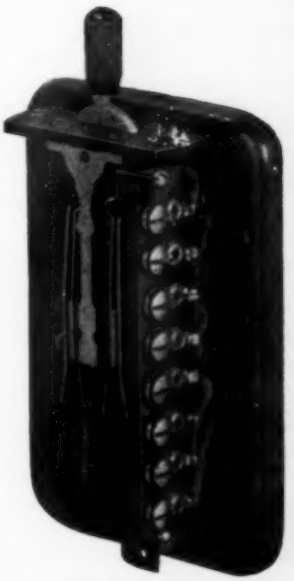
With This

Three Way Switching Key

THIS switching key provides terminals for one trunk line and three telephone lines. The key in an upright position or thrown right or left connects that particular telephone to the trunk line. With this switching key, various combinations of extension telephone service may be had.

Stimulate the interest of your subscribers for extension service by pointing out the advantages that can be had with a three way switching key and extension telephones, both in the home and office. To increase the efficiency of their telephone service they are often willing to increase the number of telephones in their office when they will not consent to increasing the number of trunk lines.

Our standard desk type telephone, The Monophone or Monophone extension set make ideal extension telephones. They will add to the attractiveness and convenience of any home or office.



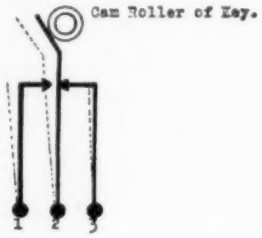
American Electric Company, Inc.

State and 64th Streets **CHICAGO, U. S. A.**

Branch Office and Warehouse—7th and Wyandotte Streets, Kansas City, Mo.

to be a poor contact between 2 and 3.

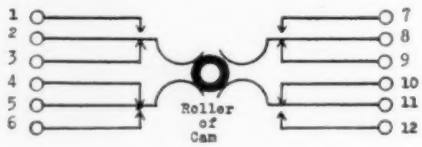
When spring 2 is moved its whole distance the three springs should be in the relative positions as shown by the dotted lines, Fig. 99. Spring 1 has been forced to the left by spring 2. This makes excellent contact between the two springs. In placing tension on the springs, always bend at the lower end of the spring, away from the contact. The spring should present a straight apeparance from the tip to the bushing. Never try to get tension by bending at the tip or contact end of the spring. Duck bill pliers or a proper spring bender should be used for



Showing proper adjustment of Key Springs to give good contact pressure.

FIG. 99

bending purposes. The manufacturer of the keys in your switchboard will supply you with proper spring benders at a reasonable cost. It is very important to see that all springs make the travel as shown by the dotted lines in Fig. 99. If this is done, good contact will result.



Typical method of showing Key.

FIG. 100

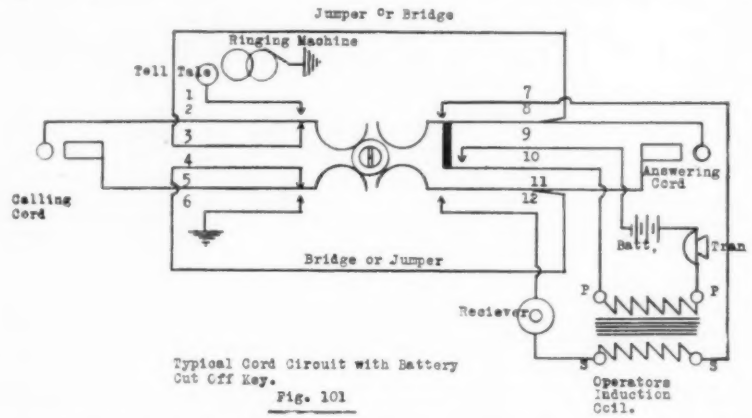
In Fig. 100 is shown a six spring key. Here the cam roller can be moved two ways. When the cam is normal or in the center, springs 2 and 3, 4 and 5, 8 and 9, 10 and 11 are making contact. Often we find that the cam roller is crowded so tight between the blades of the springs that springs 2-5-8-11 are resting against the roller. If the roller were taken out these springs would be seen to move in against the break contact springs driving them back further. In other words, the blade springs have been prevented from exerting their full pressure against the break springs. There should be freedom of the cam roller between the springs when the key is normal.

When the key is operated either to left or right, springs 2 and 5, if movement is to the left, must move out far enough to break away from springs 3 and 4 and must also move far enough to contact with springs 1 and 6. *In all telephone talking circuits it is necessary to open or close both sides of the circuit, else there will be noise due to capacity unbalance of the lines connected.*

Cord Circuit with Battery Cut Off Key

In Fig. 101 is shown a typical magneto cord circuit. The operators' transmitter battery is cut off the transmitter when the key is closed and closed when the key is operated in the talking position.

Between springs 3 and 8 and 4 and 11



Typical Cord Circuit with Battery Cut Off Key.

Fig. 101

there are two jumpers or bridge wires. In some types of keys this jumper consists of a strap of copper connecting these springs. These cause trouble by breaking away from the springs. It is common practice now to remove these jumpers and run them in the cable form with the other wires connected to the key. In doing this it is quite possible to reverse or cross connect them. That is, spring 3 might be connected to spring 11 and spring 4 to spring 8. Then even though the test in Fig. 96 was correct, the tips of the calling and answering cords would not buzz through.

Suppose springs 5 and 6 should be touching while the key is normal. This would place a ground on one side of the circuit which would cause noise when lines were connected. The same would be true of springs 1 and 2, although the noise would be worse. The buzzer can be used to check such trouble in the keys.

If, when ringing, spring 3 followed spring 2 all the way until it had completed its contact with spring 1, this would throw a bad noise back to the subscriber connected to the answering cord, which would be very annoying. To check this condition, connect a telephone head receiver with a spare telephone jack. Connect the receiver by this to the answering cord and listen while you pull the ringing key. Any such condition as mentioned above will show up in the receiver. If the key is correct, there should be no generator noise heard in the receiver when the ringing key is operated.

Battery Noises when Opening Key

When the talking key springs are operated the operators' induction coil secondary and receiver are connected by springs 7 and 12 to the cord circuit. We will suppose the operator is answering a call and had a telephone connected to the answering cord. Now if the springs 9 and 10 are closed the flow of battery through the primary of the induction coil will induce a current flow in the secondary. If this disturbance takes place before the contact is completed between springs 7 and 8, and 11 and 12, the induced current will find no circuit over which to flow and will die out. If, however, the secondary circuit is completed before the battery flow commences, then the induced current surge in the secondary will complete its path through the telephone connected to the answering cord, and will cause quite a bad click. Adjust springs 9 and 10 to make before the outer springs, and there will be no annoying click in the operator's ear.

Check springs 7 and 8 and 11 and 12 to see that they break contact when the key is normal. This will prevent noise and crosstalk from appearing on the board.

The ring off drop has been omitted from this circuit and will be considered in the next chapter.

Sticking Keys

The cam roller on some makes of keys has a bad habit of becoming dirty, and will bind on the springs. This causes a grinding noise when the key is operated, and the key will not restore with a good snap. A little paraffine wax rubbed on a piece of paper or thin cloth and placed between the roller and the springs will stop this. Move the roller to the left, place the waxed cloth on the right side of the roller, then move the roller over to the extreme right. This will force the waxed cloth between the roller and the right hand springs of the key. Then repeat for the other side of the key. Care should be taken not to get too much wax on, or the key might not stay open in the talking position. *Never use oil or vaseline to make a key operate easily, as these substances will collect dust. Some mineral oils will destroy the hard rubber roller.*

The contacts of the keys must be kept clean. A good burnishing tool is a good investment. A clean flat piece of steel passed between the contacts will clean them. Never under any circumstances use paper of any kind to clean contacts. The lint and small particles will put on more trouble than you take off.

Converting Manual Central Battery Telephones for Automatic Operation

By E. O. WALKER

Technical Publications Staff, Automatic Electric, Inc.

While it is preferable to install new automatic telephones when converting a telephone plant from manual central battery to automatic operation, it sometimes occurs that the operating company, for reasons of economy, prefers to modify its existing manual telephones. This can be accomplished by the addition of a dial, which is wired into the telephone circuit so that the impulse springs will be in series with the lines, and the shunt springs will short-circuit the transmitter and receiver or do the equivalent thereof. Usually no other changes are necessary.

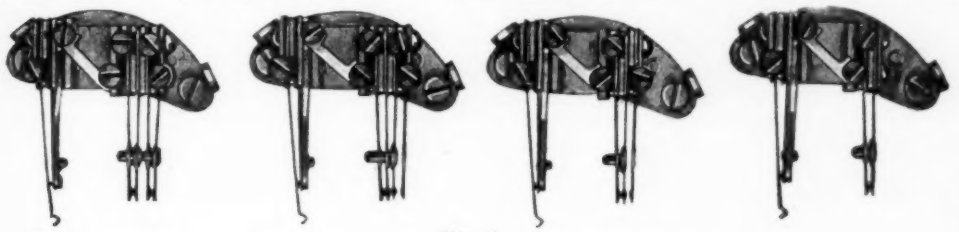


Fig. 1
Different Spring Combinations for Type 24 Dial

In order to reduce the wiring changes to a minimum, the various shunt spring combinations shown in Fig. 1 are available. As an example of the wiring changes necessary, it will be assumed that the typical manual telephone circuit, shown in Fig. 2 in both schematic and wiring diagram form, is to be modified. This is one of the most efficient telephone circuits devised for automatic as well as manual operation, and for this reason many operating telephone companies have found it expedient to convert their existing telephones to this circuit—if the circuit is not already in use—at the same time that they add the dial, thus standardizing on one fundamental circuit for all telephones. To do this, it is sometimes found necessary to replace or add an induction coil.

The changes necessary to modify the circuit shown in Fig. 2 for automatic operation are made in the desk stand, the bell box remaining the same. The ringer, however, must contain a biasing spring if more than one bell is connected to a line, in order to prevent the other bell or bells from tinkling when dialing is taking place. Figs. 3 and 4 show in schematic and wiring diagram forms, two methods of modifying the manual circuit. It will be observed that the circuit can be converted by using two different dial shunt spring assemblies. Fig. 3 shows the revised circuit wherein the shunt springs short-circuit the receiver and transmitter when dialing; and Fig. 4 shows the revised circuit wherein the shunt springs short-circuit the transmitter and open the receiver unit. Both methods accomplish the same purposes, i. e., they short-circuit the resistance which the transmitter would introduce in the dialing circuit, and prevent the dial impulses from being heard in the receiver. In both circuits, dialing is through one winding of the induction coil. Each circuit has its advantages and disadvantages, which will be explained.

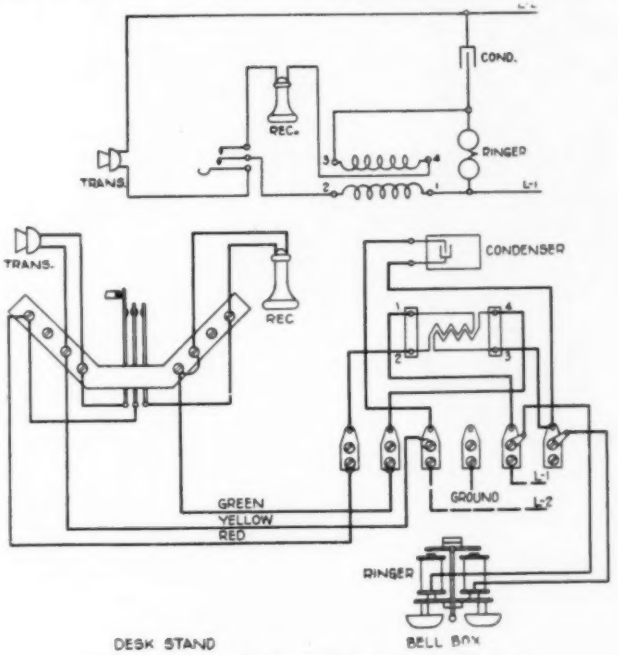


Fig. 2 Typical Manual Telephone Circuit

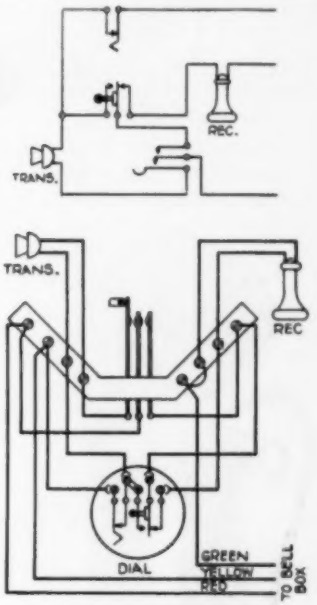


Fig. 3

The circuit in Fig. 3 is an ideal one for metallic ringing. Short-circuiting the receiver to prevent dial clicks is the most practical method, since in doing so, the receiver winding of the induction coil partially shunts the ringer and tends to prevent it from tinkling with dialing. The condenser is also placed across the impulsing springs in series with this winding. This reduces sparking at the spring contacts by absorbing the inductive discharge from the line relay, improves impulsing, and tends to prevent inductive or static disturbances caused by dial impulsing. For grounded ringing, however, the ringer circuit shown in Fig. 3 cannot

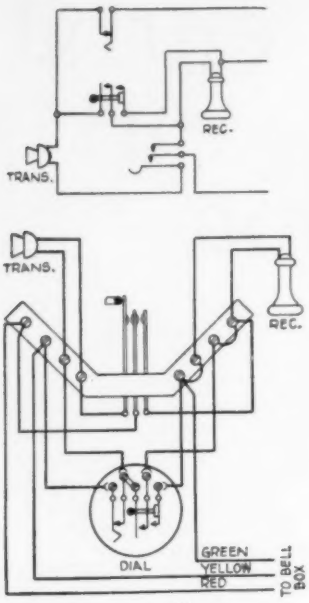


Fig. 4

be used, because the bell in this case will be connected to ground instead of to line "Ll," and accordingly one side of the telephone line will be grounded while dialing. To overcome this objection a separate condenser is employed and the bell is connected to either side of the line and to ground through this extra condenser. Therefore, when grounded ringing is employed a bell box having two condensers is required.

This objection does not apply to the circuit in Fig. 4, since the shunt springs open the circuit, from one side of the line to the tap between the two shunt springs which are normally closed, will cause the receiver circuit to remain open, and the telephone to be out of service until the contact is cleaned.

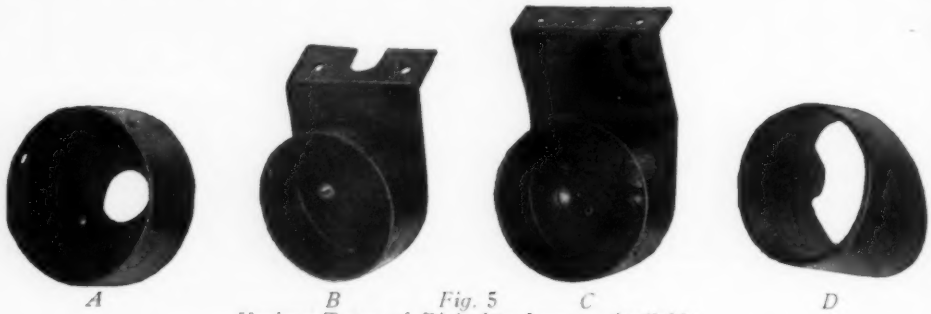


Fig. 5
Various Types of Dial Attachments Available

An open contact in the shunt spring of the circuit in Fig. 3 will not cause this trouble; the most serious condition that can occur in this case is for the subscriber to hear the dialed impulses in the receiver. For this reason the circuit modification shown in Fig. 3 is the one recommended.

The simplest method of adding the dial consists of attaching a dial mounting to the telephone. Fig. 5 shows the various types of dial mountings employed. "A" illustrates the mounting used on the desk stand. When the dial is secured to the telephone by means of this mounting, the telephone has the appearance as shown in Fig. 6 which illustrates a typical manual desk stand converted for automatic operation. "B" and "C" show the types of dial mountings used to convert small wall sets. They differ only in their brackets and the manner of running the wires into the mounting. On some telephones, one style bracket will be more appropriate than the other. Fig. 7 shows a typical manual wall telephone converted to automatic operation by the use of mounting "B." Mounting "D" is used on the old style wall set having a long backboard.

A much neater and more desirable method of converting manual desk and wall telephones of the better-known manufacturers can be made by replacing the existing base of the desk stand or cover of the wall telephone with one which is arranged to hold a dial. These can usually be secured for the latest types of manual telephones. Fig. 8 shows a cutaway view of the base and its base plate which is manufactured by Automatic Electric, Inc., and used for converting the ungrounded type W. E. Co. manual desk stand. The figure shows the manner in which the base is fastened to the stem of the telephone.

Telephone companies contemplating changing from manual to automatic operation at some future date, should consider the adoption of Automatic Electric Inc. telephones minus a dial, for manual operation. In this type, the dial hole is covered with a blank fitted with or without a designation card holder as shown in Fig. 9. At the time of the conversion, it is only necessary to remove the blank and insert a dial.

While what has been stated will give

Fig. 6
Manual Desk Stand with Dial Attached

Fig. 7
Wall Telephone with Dial Attached

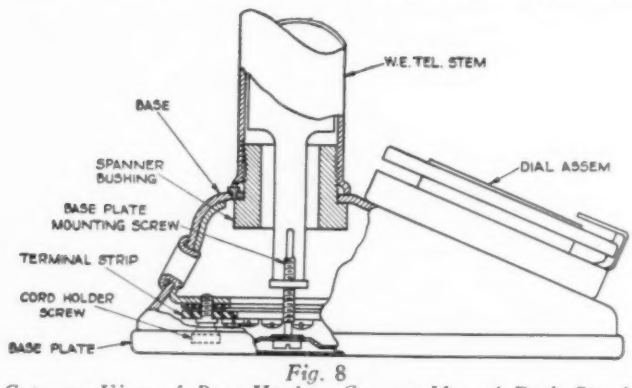


Fig. 8
Cutaway View of Base Used to Convert Manual Desk Stand for Automatic Operation

a conception of the methods by which a manual telephone circuit can be modified for auomatic operation, Automatic Electric Inc. will be glad to co-operate with any telephone company and assist them in meeting their individual requirements.

Fig. 9-A
Automatic Desk Stand with Dial Blank in Place of Dial

Fig. 9-B
Wall Telephone Showing Dial Blank Fitted with Number Card

Minnesota Convention Tingles With Business Activities

The Nineteenth annual telephone meeting of Minnesota's Independent Telephone Association opened in Minneapolis, Tuesday morning, January 24, at the Radisson Hotel, where the entire fourth floor was occupied by the various dealers catering to the trade, registration rooms, committee rooms, etc. Forty-six representatives were in attendance with exhibits.

There seemed to be an almost universal effort on the part of most delegates to clarify to themselves their individual whereabouts in the rapidly moving course of events that have gained such momentum the past year. More delegates were in attendance than ever before in the history of the association, as was evidenced by the registration books, showing a total of three hundred and seventy delegates present during the three days of the meeting. All records were broken, too, for number of seats sold for the big banquet and fun fest which took place Wednesday night in the Flame Room where four hundred and ninety hungry guests were served and entertained with various vaudeville acts; after which the floor was cleared for dancing.

A joint meeting of the board of directors and advisory board was held Tuesday in the assembly room, mezzanine floor, at which matters pertaining to plans for the coming year were discussed. In the afternoon President P. M. Ferguson, of Mankato, called the convention to order and made a fine address welcoming the delegates and congratulating them on the imposing size and importance of their association as it now was. He was followed by C. G. Kingsley of the Liberty Mutual Insurance Company, and he in turn by a new oratorical light in telephone circles, Mr. J. R. Dooley of Clearwater who spoke of some of the problems of managers of small exchanges. His talk made a big hit and uncovered a rich vein of humorous references to commissions who hamper the destinies of small town magnates in the public utility lines, especially telephone managers. His observations were clear and to the point and his noted namesake "Dooley" must at least have been a near relative. Full of jokes but withal replete with good common sense were the observations of this telephone man who has been in the business for close to thirty years.

There was on the whole less reminiscencing and talks of old times, probably because there were so few old timers, in comparison with the number of delegates, than at any former convention, but radio, as connected with the telephone business, sell-outs and mergers, and future possibilities for those in the business, held well the interest above all other topics.

Hon H. A. Bellows, general manager of radio station WCCO, made a fine address and in summing up his talk made the statement that the broadcasting business was ninety per cent telephone work.

J. M. Plaister, manager of the Fort Dodge Telephone Co., was to have followed Mr. Bellows on the program, but was unable to be present on account of sickness, and Mr. G. W. Robinson, president of the Tri-State Tel. and Tel. Co., was also unable to fill his part on account of business affairs taking him east just before the convention convened. Roy Wilder, commercial superintendent of the Tri State Telephone and Telegraph Company, doubled for Mr. Robinson and made his usual good sensible talk.

Wednesday's program held the greatest treat in store for all in the address and demonstration of S. P. Grace, on latest discoveries and inventions of the Bell Telephone Laboratories of New York City. He held his audience practically the entire afternoon in intense absorption with his revelations and graphic illustrations of the art of handling sounds, which is after all the fundamental of the telephone business.

One pleasing feature of the convention was the large number of visitors from neighboring states, many of whom were called upon to do a little talking in the open forum meetings on the different days. At the afternoon meeting on Wednesday the following directors were elected to serve for the ensuing year:

Board of Directors

P. M. Ferguson, Mankato; Jay Greaves, Glencoe; A. H. Dreyer, Starbuck; G. M. Dwelle, Lake City; H. F. Lueders, Norwood; C. L. Scofield, Benson; Max Siman, Fulda; Irving Todd, Hastings; F. L. Wright, Alexandria; Thomas Vollom, Erskine.

Following the meeting at which the directors were elected, the newly elected directors met and elected or appointed the following officers and committees:

Officers

P. M. Ferguson, president; Irving Todd, vice president; J. C. Crowley, Jr., secretary-treasurer.

Exhibitors

Addressograph Company, American Electric Company, Automatic Electric Company, Bell Lumber Company, Cook Electric Company, French Battery Company, Graybar Electric Company, Great Northern Electric Appliance Company, Jobbers Supply Company, Kellogg Switchboard & Supply Company, Liberty Mutual Insurance Company, Leich Electric Company, T. C. Macoubrey Company, W. N. Matthews Corporation, National Carbon Company, Northwestern Bell Telephone Company, Northwest General Electric Supply Company, Page & Hill Company, T. M. Partridge Lumber Company, Price Electric Company, Reliable Electric Company, John A. Roeblings' Sons Company, Runzel-Lenz Electric Manufacturing Company, Sands Electric Company, Standard Underground Cable Company, Stromberg-Carlson Telephone Manufacturing Company, Tri State Telephone & Telegraph Company, Winona Telephone Directory Company.

Northern White Cedar Convention Show Record Year for Activities

The 32nd annual meeting of the Northern White Cedar Association convened January 31 at Hotel Radisson, Minneapolis. President L. L. Hill of the Page & Hill Co., Minneapolis, presided. The following firms were represented: Bell Lumber Co., Minneapolis; Cedar River Lumber Co., Minneapolis; Curry & Whyte Co., Duluth, Minn.; Erickson & Bissell, Escanaba, Mich.; A. C. Johnson Lumber Co., Bemidji, Minn.; MacGillis & Gibbs Co., Milwaukee, Wis.; National Pole & Treating Co., Minneapolis; Naugle Pole & Tie Co., Chicago, Ill.; Northern Pole & Lumber Co., Duluth, Minn.; J. E. O'Connell, Deer River, Minn.; Page & Hill Co., Minneapolis; T. M. Partridge Lumber Co., Minneapolis; Pendleton & Gilkey, Minneapolis; Republic Cedar Co., Marinette, Wis.; Standard Cedar & Lumber Co., Minneapolis; C. P. Tinkham, Milwaukee, Wis.; Twomey-Williams Co., Duluth, Minn.; Virginia & Rainy Lake Co., Virginia, Minn.; J. J. Seguin Co., Ltd., Quebec, Canada; Gaynor Lumber Co., Sioux City, Ia.; Jake Reigel, Deer River, Minn.; A. C. Winner & Co., Minneapolis; J. W. Morrison Lumber Co., Minneapolis; Scott Pole & Treating Co., Minneapolis; Joslyn Mfg. & Supply Co., Chicago, Ill.

Waiving precedent, President Hill delivered no address in view of the fact that the committee reports were expected to consume the better part of the two-day session.

Secretary Boucher made a very comprehensive report of the activities of the association for the past year and offered a number of suggestions for the betterment of conditions the coming year. His report showed that the cedar industry is threatened with substitutes in the way of poles, posts, etc. It was pointed out that iron fence posts were being used very extensively because of the fact that they were easy to set, being driven in the ground, which made it possible for a user to cover territory quicker than could be done where other type of posts were used. It was pointed out, however, that iron posts would not last as long as cedar, owing to the fact that rust would shorten the lives of iron posts. Other items were also covered by the secretary's report.

The treasurer's report indicated that the finances of the association were in good shape, although very little activities were reported other than routine work through the secretary's office. Committee reports showed that unusual activities prevailed in each department during the administration of President Hill, though smaller number of poles and posts were disposed of during the past year than heretofore.

It was contended by R. J. Henderson head of the traffic department of the National Pole & Treating Co., that freight rates on cedar poles to Texas points were unreasonable, especially so since the rates to west Texas were fixed by the Interstate Commerce Commission. Nothing has been accomplished so far, but it is felt that some relief may be expected during the year.

The advertising committee reported that certain manufacturers of pine poles were using misleading statements in their advertising; that the matter had been called to the attention of said advertisers and after conferences a promise was secured from them that such misleading statements would not be repeated, but in face of this promise advertising was appearing which was unethical, misleading and in many cases untrue.

Much information was furnished by the committees which made this meeting one of the most interesting in history. In fact it was a strictly business meeting from the first till the end of the second day.

A banquet and entertainment was furnished in which more than one hundred participated, followed by a dance at the local hotel, where the meeting was held.

The election put an end to the most successful meeting the Northern White Cedar Association ever had. Mr. G. H. Ramsey of the National Pole & Treating Co., Minneapolis, was elected president, Mr. W. L. Lafean of the Naugle Pole & Tile Co., Chicago, vice-president, and Mr. H. F. Partridge of the T. M. Partridge Lumber Co., Minneapolis, was elected treasurer. Directors chosen were Mr. Don C. Bell of the Bell Lumber Co., Minneapolis; Mr. J. E. Gerich of the MacGillis & Gibbs Co., Milwaukee, Wis., and Mr. L. A. Page of the Page & Hill Co., Minneapolis. Norman E. Boucher of Minneapolis was continued as secretary.

St. Paul Capitalists Buy Control of Tri-State Company

Controlling interest in The Tri-State Telephone & Telegraph Company, St. Paul, Minn., passed from Pittsburgh to St. Paul February 1, 1928, when a group of St. Paul business men, headed by Mr. G. W. Robinson, president of The Tri-State Company, completed a deal whereby controlling stock, formerly held by Pittsburgh interests, was purchased by local investors. Coincident with the purchase announcement Spencer, Trask & Co., Chicago, and the Wells, Dickey Co., Minneapolis, made a nation wide offering of 35,000 shares of no par value, priced at $104.5 a share. The new stock will pay dividends of $6.00 a share. A total of 100,000 no par value shares are to be disposed of at that price.

It is anticipated that the Board of Directors will be substantially enlarged to include a number of St. Paul men who have bought into the corporation. This will come up at the time of the annual directors' meeting in April.

The Tri-State Telephone & Telegraph Company, incorporated May 16, 1903, under the laws of the state of Maine, is one of the leading Independent telephone companies in the United States. It owns and operates, without competition, a comprehensive telephone exchange and toll system throughout 38 counties in Southern Minnesota, having a combined population of about 1,000,000. The principal cities served include St. Paul, Stillwater, Winona, Faribault, Owatonna, Austin, Albert Lea, Red Wing and Rochester.

The company's earnings have been characterized by steady growth over a long period of years. In 1923 gross revenues were $4,812,615.00, with net earnings, after deducting taxes, depreciation and all charges of $884,846.00. In 1927 gross revenues were $5,607,469.00 with net earnings of $1,206,036.00.

Dividends at the rate of 8% per annum were paid on the 500,000 of $10 par value common stock in 1922, 1923 and 1924 and thereafter at the rate of 9% per annum up to the date of the issuance of the present no par common stock. The directors will inaugurate dividends on the no par common stock of April 1, 1928, at the rate of $6.00 a share per annum from January 1, 1928. This $6.00 annual dividend rate compares with $4.50 per annum received by the common stock holders on a proportionate amount of the old common stock. Dividends have been paid on the preferred stock without interruption since its issuance over 24 years ago.

The depreciated valuation of the company's physical properties as determined by the Minnesota Railroad & Warehouse Commission as of December 31, 1920, plus the cost of net additions since that date and up to and including December 31, 1927, is $19,858,612.00.

No change of management is contemplated as a result of this transfer of control according to Tri-State officials.

Danville Phone Rate Increase Is Allowed

Danville, Ill.—It has been announced that increased teleephone rates approved by the Illinois commerce commission have become effective Jan. 1. Single party business lines, $3 a month, went to $6, with corresponding boosts on other lines.

LINE AND DESK

A PUSH BUTTON RINGING PROBLEM

We have the following letter from an Iowa subscriber relative to push button ringing circuits for party lines:

"Referring to the article in January TELEPHONE ENGINEER on Studying Details of Telephone Work, by E. R. Collins, I have been very much interested in push button ringing for rural lines. We have two phantomed rural lines. I am enclosing a sketch of one of these on which we have some trouble. The way it now stands as shown, subscribers 9-10-11 on both physical circuits have a hard time getting the operator. The phantom line with 16 phones rings in the office very strong at all times.

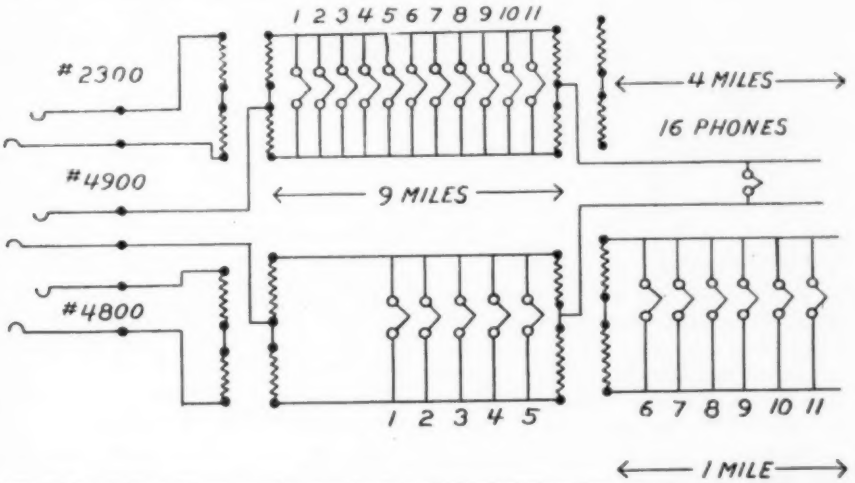
I have been trying to devise some way to install push button service for operator calling, but so far find no way to do it without unbalancing the circuit. These lines parallell a 33,000 volt high line, but are very quiet, though a very small ground will make them noisy.

The circuit he has in (Fig. 90) would be ideal for straight metallic lines, but would like to know if it would be the thing for phantom lines?

Would the retardation coil bridged across the line make it any harder for the line stations to ring each other on the physical circuits?

Please refer this to Mr. Collins and ask him to answer this in Ferbruary TELEPHONE ENGINEER."

The problem is referred to Mr. Collins for suggestion. It is interesting to note that the subscriber says that the circuits are very quiet in spite of exposure to 33,000 volt transmission lines. Evidenty they must be properly transposed and are kept almost perfectly free from grounds.



TECHNICAL INFORMATION

I note that Mr. W. V. Sylvester states in the January issue of TELEPHONE ENGINEER, that "We don't any of us know anything," or words to that effect. "Now, why did he have to bring that up?" A lot of us have been suspecting this for some time but don't usually care to admit it so openly. Now Mr. Sylvester has brought out some very interesting thoughts but I cannot agree with him on all of them. First I am of the opinion that he is the type that wants to get into things just a little deeper than the average telephone man, who does not care much just what makes the wheels go around if she talks up well. I am also of the opinion that the data mentioned by Mr. Sylvester is required more in the laboratory and in the design and improvement of equipment than the field for the average practical man. I feel that a satisfactory margin of safety to take care of the average overload is taken care of in the design of modern telephone apparatus.

I have always found manufacturers very willing to supply any data in regard to their equipment which was not available on drawings or catalogs.

Now in regard to the trouble Mr. Whitson is having with the woodpeckers. I would suggest that he catch the little pests and clip their little "pickers" off with a pair of side cutting pliers, which I am sure will eliminate any future trouble from this source.—RAY BLAIN.

ENGINEERING THE TOLL POLE LINE

It is interesting to study the development of engineering the toll poles.

In the early days poles were usually set about 35 to the mile and little attention was paid to storm areas, pole strengths, classes of toll lines, future growth and other technical things which enter into the plans today.

There are five main factors which enter into the engineering of toll pole line now, First, the lines are classified according to their importance. That is, according to the number of messages which pass over the wires and the distance these calls travel. Secondly, the toll lines are studied for storm loading areas in our territory. For instance there are certain localities which are visited by sleet storms more than other parts and those lines which are subjected to severe storms must be made stronger. Thirdly, the engineers consider the load on the poles, or the weight of the wires, both now and what the poles might have to carry in the future. Fourthly, the poles are selected from the standpoint of strength, kind of material, length of life and cost. The fifth point is adequate routes for the lines which must be accessible so they can be repaired or replaced when necessary and clear of interference such as trees and power lines.

CONRAD J. JOHNSON, in *The Northwestern Bell.*

SAFETY SUGGESTIONS

The following safety suggestions were provided by O. E. Robinson's gang and by Construction Foreman Slaughter's gang, at Houston, for *The Safety Belt:*

"When riding on a truck, get in one place and stay there until the truck stops."

"Don't nail wood brackets to a pole after insulators have been placed on brackets. Put the brackets on before installing insulators."

"Don't drop off a pole just because you think you are close enough to the ground so that it won't hurt you."

"In pulling strand or open wire to new pole, keep on the lookout for light wires."

"Don't ride strand that is close to light wires without special instructions from the foreman."

"Before leaving a pole make sure that it is well covered according to instructions and see that the entire hole is covered in a good, substantial manner."

Commercial Activities

By H. F. McCULLAS

In the larger telephone organizations, as we know, responsibilities and functions are necessarily divided among several departments. In those larger organizations, due to the number and variety of responsibilities and functions, it is necessary to draw rather definitely the line of demarcation between department functions. In the smaller organizations this line is not so necessary or is it as definitely drawn, yet it is in evidence and of course serves a very good purpose. However, in the smaller exchanges of even the largest company you will find little evidence of any division of responsibilities by departments. The reason for the disappearance of this line of demarcation is apparent when one considers how illogical it would be in the small exchanges to attempt to functionalize in too great a degree the activities of the various departments. There may be an exception to this statement as applied to the smaller exchanges in the case of the traffic department, because this department rather logically sets itself apart from all other departments. This statement, however, is literally true of the other two departments usually found in even the small exchanges, viz: the commercial and plant departments.

What about the subject of commercial or business activities? Briefly, they may be considered as of two types: first, those activities having to do with the internal operations of the telephone company; and second, those having to do with the external operations of the telephone company as it concerns the telephone using public. It is about the latter type of activity that we wish to talk.

Let us not be confused in our consideration of this subject by attempting to talk about a particular department of a telephone company. We are not so concerned with departmental responsibilities as we are with getting the job done. We might even broaden the scope of our treatment of this subject to say that any activity of a telephone company that has a bearing on the relationship between the company and the public which it serves is in some degree a commercial or business activity.

This question may arise in your mind: What is the justification for any particular consideration of commercial or business activities? In other words, why should we consider this matter at all? I believe that the justification is apparent when we stop for a moment to realize that that today business of all kinds is done on the basis of salesmanship and not on the basis of order taking. A few years ago, immediately following the world war, business resolved itself into one of order taking with very little need for salesmanship. That day has passed and we need not expect to see it again within the span of our lives. So we are necessarily concerned with the selling of our organization and our product to the public. Hence the obvious justification for a telephone organization taking the iniative in selling to the public its organization and its product.

How the Commercial Program Is Formed

What is the logical way in which to approach this subject which has so far been rather indefinite as far as reference to any specific item of commercial activity is concerned? We might answer this question by asking another: How would we start to build a building? Or how would we start to get ready to build a building? Would we gather all of the material, have it deposited near the site of the proposed structure and then start thinking about the plans for building? Hardly. How would we go about it to build a telephone exchange property? Would we order the poles, the wires, telephones, cables, cross arms and all other units of telephone property that would be needed, have all of these units delivered to the scene of building and then start talking about our specifications and our plans for construction? The answer to that question is most apparent.

There seems to be no good reason why we should not approach our subject today in just such a fashion. So to be logical, let us arrange these items of commercial activities in some reasonable order, program them, as it were.

What do we find first in this program of commercial activities? Properly, the item that should be considered first would be the one which has to do with the selling of our organization with its problems and policies to the public—the item of advertising, or publicity, or both. When we think of advertising or publicity, we are too prone to think of newspaper space and let it go at that. Our approach to this subject includes the item of newspaper advertising as only one among a number of items. Every contact made with the public through whatever medium it may be should be considered as an opportunity for advertising our organization.

What is the first tep in this program of selling our organization and its products to the telephone using public? It seems that the first thing for us to do is to familiarize ourselves thoroughly with the progress which has been made in the telephone field. We cannot expect to tell our story in an understandable way unless we are thoroughly familiar with it ourselves. Then tell them of our problems. Figuratively speaking, lay our cards on the table. We may not think now that there will ever come a time when we will want to go to the public with a rate increase program. These rate increase programs have a faculty of coming to light at unexpected times and it behooves us to have our relationship with the public in good shape when it does become necessary for us to ask for more revenue.

Tell the Public of Telephone Progress

Then tell them about the progress in the art of telephony. Tell them about the developments that have been made through the research work that is carried on constantly. Tell them for example, about television, transatlantic telephone conversations, the artificial larnyx, the artificial receiver or teletactor, about telephone repeaters, improved permalloy the new metal for relay and repeating coil cores. You will be surprised at the reaction that you receive from the public when you tell them about tremendous strides that have been taken by telephone people in developing all of these factors of transmission.

The next question may well be, how are we going to tell the folks about these things? It seems to me that there are two principal mediums: first, by personal contact between the telephone company employes and the public; and second, by the use of the printed word, by far the more valuable of the two of course is the medium of personal contact.

Consider the following few examples of opportunities for taking the initiative in telling the public about our business: Ask the organized groups in your community to visit your exchange and see for themselves the equipment that serves them. You will find that all of these groups will gladly accept an invitation to visit your central office. Among these groups may be found your community club, your Parent Teachers' Association, your school groups and perhaps a civic club.

Then take the initiative in arranging for members of your employe personnel group to appear before these same organized bodies for the purpose of telling them about the telephone business. Your first reaction to this suggestion may be something like this: "We have no one

Abstract of an address given before Nebraska State Telephone Association 1928 Convention, Kearney, Nebraska.

in our organization who can qualify as a public speaker." Well, frankly, we are not talking about public speakers. We are talking about telephone people who have the courage of their convictions and can get up before a group of folks and tell them interesting and simple facts about the telephone organization and the thing it is attempting to do. That is not a difficult process and the reaction that you will obtain from your listeners will make you wish that you had attempted this particular type of advertising a long time ago.

Another medium for this activity is the use of a small switchboard demonstration unit. If you are operating a magneto exchange use a small magneto board; if you are operating a common battery exchange, use a common battery board. Take the initiative in making arrangements with your organized groups to give this demonstration. In other words, you carry the message to your people and not wait for them to come to you.

Another medium is through the active participation by representatives of your telephone organization in your commercial or community clubs. Use this medium to spread the truth about your organization to the business and professional men of your community. Take your place where you rightfully belong as telephone people in the life of your community. You know there was a time when telephone folks were prone to sit back and let the other fellow take all of the credit for being an asset to the community. That time has passed.

Commercial Service Study a Valuable Aid

At this point, I want to refer briefly to another commercial activity that is rapidly gaining favor with the telephone using public. This activity is as applicable to a small exchange as it is to a large exchange; and is the one of commercial service studies. The telephone using public has in a large measure taken the initiative in attempting to determine the telephone facilities and service necessary for its use. When you stop to analyze this matter, this is just the wrong approach to the subject. The reverse most assuredly holds true and telephone companies at large have begun to realize this and have taken the initiative in considering the needs of telephone subscribers and interpreting these needs in terms of service and equipment. The best time to do this of course is before service is established It is surprising how grateful your subscribers will be for this service when they understand that it is a part of the broader service that the telephone company is trying to give.

Due to our delay in getting started on this program a large percentage of our service of course is already established and this forces us to consider a somewhat different service survey situation in that we are surveying telephone service and facilities already established. In rendering this service every factor that enters into the giving of service should be considered—the number of incoming and outgoing calls to the subscriber's station, the character of these calls particularly as divided between business and personal, the number of calls per hour reflected in the ability of the circuit or circuits to handle the load, the location of the subscriber's instrument, not only from the standpoint of availability to the subscriber but also from the standpoint of environment, the condition of the equipment, its use both physically and orally by the subscriber, and all of the other elements, with which the average telephone man is familiar.

If you have not already offered this service to your users, we suggest that you try it and I am sure that you will be gratefully surprised at the splendid reception given the idea by your subscribers and the splendid reaction that you receive from them.

Use Printer's Ink

Now let us discuss for just a few moments the use of the printed word as the medium for telling the public about our business.

Some telephone companies have used window displays of telephone equipment to excellent advantage. It is true that the telephone company does not always have a suitable display window in its building but it is entirely possible to make arrangements with one or more local merchants to use their display windows for your purposes. It may seem a trifle presumptuous to even think of asking the merchant to turn over his show windows to you when he needs them for his own business. However, a good way to get around this point and one that is productive of a better understanding between the merchant and the telephone organization is to work out what is termed a cooperative display and through this medium tie the merchant's business in with the telephone business. A rather reasonable solution, is it not?

Then of course as a second medium, you have your newspaper space which is always usable and always an excellent medium for advertising and publicity.

The use of motion picture advertising in your local theater offers an excellent medium for getting across messages about specific subjects.

An excellent idea is the use of pamphlets telling about the different phases of the telephone business.

In fact there are so many different ways of selling your organization and its products to the public that I sometimes feel we are just skimming the surface when it comes to doing a real thorough job.

Specific Service Can Also Be Sold

Up to this point we have talked about selling the organization to the public. Now let us talk for just a few minutes about selling specific items of revenue production. After all, one of the major functions of the commercial people of a telephone company is to sell service; in other words to be responsible for the production of revenue.

When we think of this phase of our business we are usually concerned immediately with the thought of both main and extension telephones. In most telephone companies the revenue received from main and extension telephone rentals represents the larger per cent of the gross revenue. That in itself is of course a good reason for giving these two items serious consideration.

I think that at times commercial folks are inclined to be more interested in selling service to non-subscribers than they are in retaining present subscribers on the books. In considering the sale of rental service we might well think of it in the following order:

1. Keep the subscribers that are already receiving telephone service.

2. Sell service where the plant is already in existence and where little, if any, additional investment will be required.

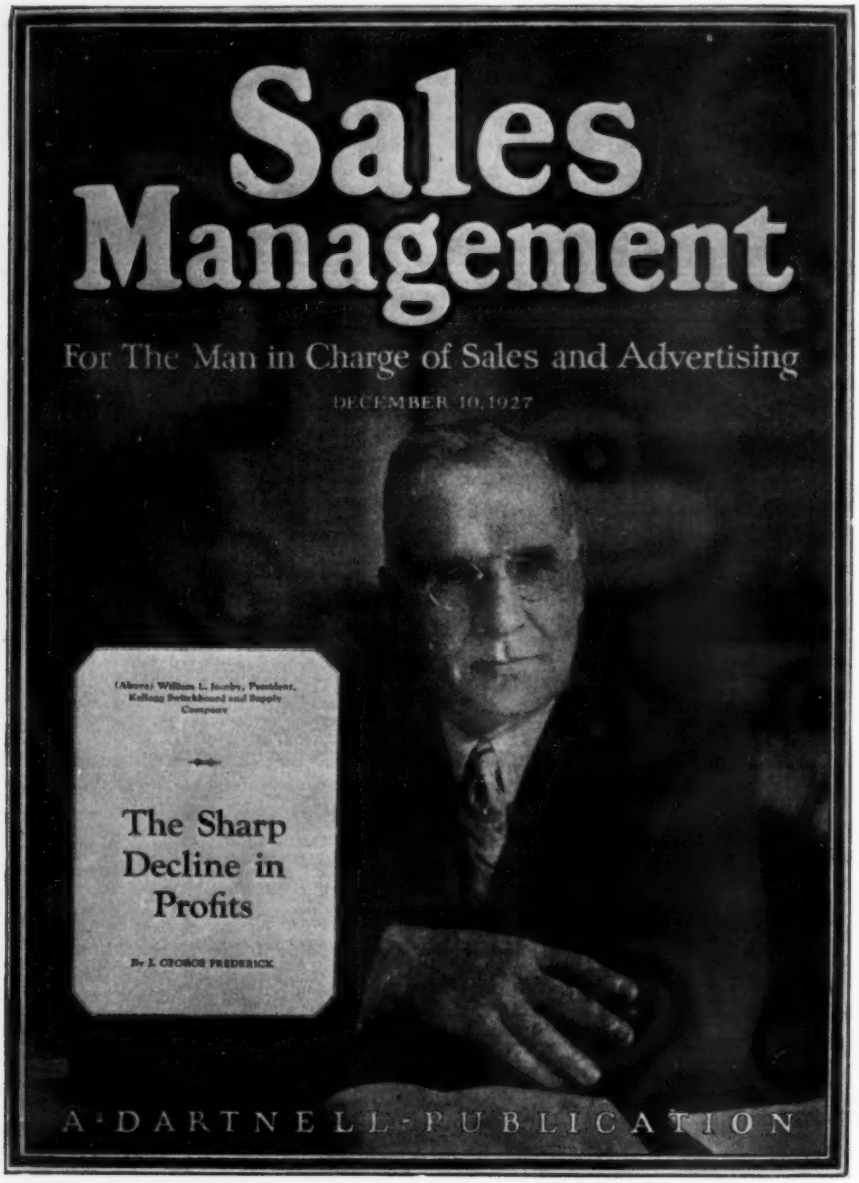
3. Sell service where it is necessary to build plant justifying this expenditure of course in view of immediate or potential revenue production.

In most organizations toll revenue represents the second largest item of revenue. For that reason every reasonable effort should be made to develop and sustain our toll business. Every time a subscriber is added to our list there is a possibility of increasing our toll revenue as well as our rental revenue.

Just like other industries that have developed the sale of by-products the telephone industry is falling in line. What are the by-products of a telephone business. From the general viewpoint we might say that all items of revenue other than rental and toll are revenue from by-products. Some of these are derived from: space sold in telephone directories, from extra bells, extension gongs, keys, buzzers, monophone sets, extra length cords and shelves. It would be surprising to know the percentage of the gross revenue of some of our larger companies represented in the revenue received from their so-called by-products.

So you see that when we start to arrange all of these items in a logical manner we find that our time is well spent. In addition we have this thought brought forcibly home to us: that in the evolution of the telephone business so many new phases are constantly arising that it behooves all of us to keep abreast of the times.

W. L. Jacoby, Kellogg's President, Featured in "Sales Management"


Sales Management
For The Man in Charge of Sales and Advertising
DECEMBER 10, 1927
(Above) William L. Jacoby, President, Kellogg Switchboard and Supply Company
The Sharp Decline in Profits
By J. GEORGE FREDERICK
A DARTNELL PUBLICATION

President Jacoby of Kellogg Company, gives interview regarding qualities to consider in selecting men—Picture featured on front page cover of Sales Management for December

On the front cover of a recent issue of *Sales Management* magazine, there was featured a picture of Mr. W. L. Jacoby, president of the Kellogg Switchboard & Supply Company. In addition, there appeared in the same issue an article reporting an interview with Mr. Jacoby regarding some of the measurements he uses in selecting men for an organization. The title of the article is "Four Qualities to Consider in Selecting Men." The four qualities named by Mr. Jacoby as essential characteristics in the men he hires are co-operation, character, aggressiveness and diplomacy.

Speaking of co-operation, Mr. Jacoby points out that a spirit of harmony and helpfulness between members of an organization is of more importance than individual brilliance. He says that in selecting men he desires, first of all, men who regard the progress of the business as a whole above personal gain or honor; men who "mesh in" with the head of the company, with other department heads and with the members of their own departments. He names two or three interesting incidents to prove that co-operation is of greater importance than individual brilliance.

Mr. Jacoby also emphasizes the importance of good character in the men he selects for positions in his organization. "Without character," he says, "other qualities are of little value. The characterless individual invariably proves himself unworthy of trust."

The third requirement Mr. Jacoby demands of a co-worker is force. He says, however, that there are two kinds of force, one is a sort of misdirected aggressiveness which antagonizes everyone coming in contact with it, the other is the kind of force that gets things done but does not offend.

The fourth characteristic that Mr. Jacoby demands of his associates is diplomacy. It links up, he says, with force. Force, without diplomacy, may get things done, but the use of diplomatic force tends to rub people the wrong way. The man who is so forceful that he arouses resentment does not accomplish his purpose so effectively as the fellow who is aggressive but at the same time politic.

Throughout the article Mr. Jacoby uses various interesting incidents from his own career to prove his points.

Mr. Jacoby's long experience as a managing executive certainly qualifies him for such a discussion. During his business career he has been connected with eight different companies, seven of which he has served as president. At thirty-four he was president of the Inter-Ocean Steel Company, having raised all the $2,500,000 capital himself. During his interesting career he has been head of six other large institutions. He was elected president of the Kellogg Switchboard & Supply Company a little less than a year ago, but already has done much to bring the organization to a high state of efficiency.

Join Forces of the Kodel Radio Corporation

A. J. Kohn, for the past fifteen years connected with the Leich Electric Company, Genoa, Ill., in various capacities, has resigned his position as sales manager of that concern to accept a position as sales manager of the commercial department of the Kodel Radio Corporation, Cincinnati, Ohio, makers of radio rectifiers. Mr. Kohn still maintains his holdings with the Rantoul Telephone Company, Rantoul, Ill. Kohn is one of the most popular sales managers in the telephone industry and he has thousands of friends throughout the country who sincerely hope that his future will prove as beneficial to him as his past has been for the telephone industry.

Line from Canada to Mexico Now in Operation Through Texas

Not only is it now possible to talk from any Bell System telephone station in the United States to Mexico City and other points in Mexico, but a call can be put through as far north as Ottawa, Canada, to Mexico City.

Frank L. Eldridge to Manage Carbon Products Co. Chicago Office

Announcement has been made that the Carbon Products Company would open a sales office in Chicago in the near future. At the same time it was announced that Frank L. Eldridge, one of the best salesmen in the telephone industry, would have charge of the offices in Chicago.

Recently Eldridge was elected vice-president of the Carbon Products Company, and will be actively engaged in the sales end covering telephone properties as well as other lines. For several years he has been selling dry batteries, with the exception of the past two years, when he engaged in other lines of business. As salesman for the French Battery Company, Eldridge covered almost every part of the United States, calling on the telephone trade as well as that of the railroad field.

During 1912 Eldridge was connected with one of the national Independent telephone associations, where he became nationally known as one of the most progressive and aggressive Independent boosters in the industry. He later joined the forces of the Kellogg Switchboard & Supply Company, where he made a reputation as a salesman second to none in the field. After leaving Kellogg Switchboard & Supply Company he entered the employ of the French Battery Company and for several years traveled extensively, making state and national conventions. Previously he had charge of the Chicago office of the French Battery Company.

Friends of Eldridge throughout the country will rejoice that he is again actively engaged in a line that will bring him in contact with the telephone interests of the country. His work, it is understood, will be to promote the sales of the Carbon Products Company through jobbers and supply houses as well as in the railway field.

Nebraskans Discuss Many Subjects at Annual Convention at Huron

Telephone men from all parts of South Dakota assembled at the Marvin Hughitt hotel at Huron on January 10, 11 and 12 for the annual convention of the South Dakota Telephone Association.

President Ira S. Burnett called the first business session of the convention to order at 2:15 Wednesday afternoon. After brief appropriate opening remarks, he introduced Hon. Don G. Medbury, mayor of Huron, who congratulated the telephone men on the progress of telephony and especially in South Dakota and Huron. Mr. Grant E. Preston, of Hitchcock responded to the mayor's welcome, thanking him for his generous welcome. He extended an invitation to the mayor and the citizens of Huron to attend any or all of the sessions, stating that the telephone people do not have any secrets, and it was the belief of the telephone people that if the public understood the problems of the telephone business, that it would eliminate many misunderstandings.

The secretary-treasurer's annual report showed a steady growth of the association and the secretary requested that every member endeavor to induce his neighbor who is a non-member to become one.

President Burnett in his address reviewed the activities of the association during the past year and urged the membership to greater efforts during the coming year. He especially dwelt upon the particular results derived from district meetings and recommended that this particular activity of the association be continued. He especially referred to the work of the secretary and paid him many compliments during his address.

Mr. J. H. Agee, general manager, Lincoln Telephone Co. of Lincoln, Nebr., was the first speaker Wednesday morning. Mr. Agee's subject was "Service from a Subscriber's Viewpoint." Mr. Agee, after his preliminary remarks, drew a vivid word picture of a subscriber's viewpoint of telephone service, stating that the subscriber was not in a position to know the problem in furnishing telephone service, but in many cases the subscriber had a right to presume that perhaps the telephone company was lax in various things that go to make up telephone service. He illustrated this statement by stating that he knew of one time where a firm had moved into a very commodius office. Everything was up-to-the-minute in the office, but the telephone company installed an unsightly instrument. This, Mr. Agee said, naturally would not promote good feeling on the part of the subscriber. He also called attention to the fact that many times telephone companies failed to advertise their buildings sufficiently, stating that he had been in small towns and he was unable to locate the telephone office, except by inquiring of many of the people he met on the street. He advocated that telephone offices should have adequate signs so they could be easily seen by the public and stated that they should be known well enough for residents in the community to be able to direct strangers to the telephone office.

The next address was by Hon. Dawes E. Brisbane, member board of railroad commissioners, Pierre. Mr. Brisbane stated that the telephone business is strictly a public institution—more public in ownership than other lines of business. He said that the telephone business was public in ownership because he believed that the telephone stock is owned by many people, who of course, are subscribers and have a special interest, from ownership standpoint, in the business. Mr. Brisbane referred to the progress in telephony and stated that he believed that within a short time, that it would be possible to talk to any part of the world. He complimented the telephone companies on their effort to produce dependable service as he said that if you visited other countries, it would bring you to realize the high type of telephone service in United States. He referred to the matter of rates and stated that the telephone companies were commendable because they did not try to charge all the traffic would bear—that in all cases they endeavor to secure only a rate that will enable them to provide efficient and dependable telephone service and reasonable return on the investment. He stated that it is the duty of the commission to supervise all rates as well as the regulations and practices of the telephone companies and to assist them in every way possible to furnish dependable telephone service and to allow the rates to be high enough to enable them to do so, with a reasonable return on investment. He stated that duplications of telephone systems were nearly eliminated in South Dakota, but there were yet a few cases and he hoped that the companies involved would get together on some kind of a proposition in the near future, to eliminate dual service in any one community. He assured the telephone people that the Commission would be only too glad to assist in any way that they could.

The next speaker was Mr. H. A. Hanson, statistician, Board of Railroad Commissioners, Pierre. After outlining the necessity for telephone accounting in which he showed that books were necessary for the maintenance of record of expenditures and revenues.

Mr. Tom Null, general attorney for the Dakota Central Telephone Company, was the first stpeaker in the afternoon. Mr. Null's address covered the development of American liberty.

Mr. M. E. Guinter, district commercial manager of the Northwestern Bell Telephone Co., of Sioux Falls next spoke on "Commercial Problems." He brought out a great many points relating to collection practices and especially discussed the value of uniform call limits.

One of the hits of the convention was a playlet directed by Miss Anne Barnes, assisted by Miss Mamie Schmeiter, traffic instructor, Dakota Central Telephone Co., Aberdeen, and Mrs. Stacia Gilbert, chief operator, Dakota Central Telephone Co., of Huron. Characters representing various stages of telephone development were:

1876, Victor Ashmun; 1886, Iva Schmeither; 1896, Ira Lambert; 1906, Esther Fry; 1917, Agnes Bristol; 1928, Zoe Cavanaugh. Pianist, Mrs. Tredway.

After the playlet, the nominating committee reports, which resulted in the nomination of the following officers being elected for 1928. Ira S. Burnett, president; Grant E. Preston, vice president; Thomas Phalen, secretary-treasurer. Executive committee, I. S. Burnett, Armour; Grant E. Preston, Hitchcock; W. W. Straight, Crooks, S. D.; M. C. Guinter, Sioux Falls; Wm. Saltmarsh, Woonsocket; H. M. Shumacker, Alexandria.

The banquet committee showed that they were very proficient as at 6:30 p. m., the banquet was held on the mezzanine floor of the hotel and everyone agreed that this was one of the finest banquets ever given by the association. At the conclusion of the banquet, we were entertained by Wm. Saltmarsh, and his entertainers, consisting of Miss Mae Saltmarsh of Woonsocket, piano and voice, Hope Ross, Miller, pianist, Lee Saltmarsh, Canova, voice.

The first address on Thursday morning was by Mr. A. L. Turner, engineer, transmission, protection, and foreign wire relations, Northwestern Bell Telephone Co., Omaha. His subject, "Use of Highways by Wire Companies." Mr. Turner explained the right to use the public highways as routes along which to construct wire lines as being sanctioned by the State Legislature, and the obligation of the telephone company in the use of this highway, would indicate that they were not to interfere with the ordinary use of highways by other traffic nor the maintenance of highways for this principal use. Mr. Turner touched upon several matters which would involve the use of highways by wire using companies, insofar as seeing that the wires were of sufficient height so as to give ample space for the ordinary modes of travel.

The next subject was "Plant Problems," by A. W. Huntzinger, chief engineer, Dakota Central Telephone Co., Aberdeen. Time would not allow a full discussion of these problems. However, most everyone present discussed some plant problem which no doubt was of great interest to all those taking in that part of the discussion.

In the afternoon, Thomas Phalen, secretary of the association, talked for a short time on the subject of "Other Conventions I Have Attended." Mr. Phalen compared the association with those of the neighboring states as to size, and stated that the problems of the association were practically the same.

Two New York-Los Angeles Direct Lines Opened

New York City—Two direct long distance circuits between New York City and Los Angeles 3,273 miles in length and the longest direct telephone circuits in the Bell System, were opened for service on December 21st.

The effect of the placing in service of the direct circuits eliminates the necessity of switching telephone calls between the two coasts at Chicago as at the present time; the calls between these two points over the new direct circuits now being completed between the Atlantic and Pacific coasts with the assistance of the New York and Los Angeles operators only.

Along the route of this new transcontinental direct circuit between New York and St. Louis, telephone repeaters have been installed at Harrisburg, Pittsburgh, Cleveland, Toledo, South Bend, Chicago, Peoria and St. Louis. Between St. Louis and Los Angeles the new direct circuits are fed by the repeaters of the Southern Trancontinental Telephone Route. Terminal repeaters have also been installed at New York and Los Angeles.

Over these two new circuits according to the estimates of telephone engineers, based on traffic in the past, between these two points, a daily capacity of 99 calls of average length of conversation can be taken care of. The present daily average of 51 calls direct between the two terminal points and 14 calls from points in adjacent territories on both the Pacific and Atlantic coasts leaves a margin for future growth of an average of 34 calls per day. This will take care of service needs over these circuits during the near future.

The estimate of telephone engineers is that the largest number of calls will be made over these lines at the average rate of 72 messages per day during the early spring of next year.

New York City and Tampa on Direct Circuit

Faster long distance telephone service between New York City and Tampa, Florida, was effected by the opening, on December 17th, of a new "direct circuit" between those two points, according to the New York Telo. company.

This means that instead of the present procedure of switching telephone traffic between New York and Tampa through Jacksonville, the calls will be completed between the two points over 1,225 miles of direct wire without the assistance of an operator at any intervening point. Not only will this speed up service between New York and Tampa direct, but it will also help service between points in the territories surrounding these two terminals.

Calls from Boston and Baltimore, for instance, can be routed over the new direct New York-Tampa circuit to many places in Florida. Estimates of telephone engineers, based on past traffic between these two points and the expected future rate of increase show that the average calling rate over the new circuit will be eleven calls per day direct between New York and Tampa, and fourteen calls per day from points beyond these terminals; this leaves a margin for growth of an average of seven more calls a day before this direct circuit is used to its capacity.

Public Utility Financing

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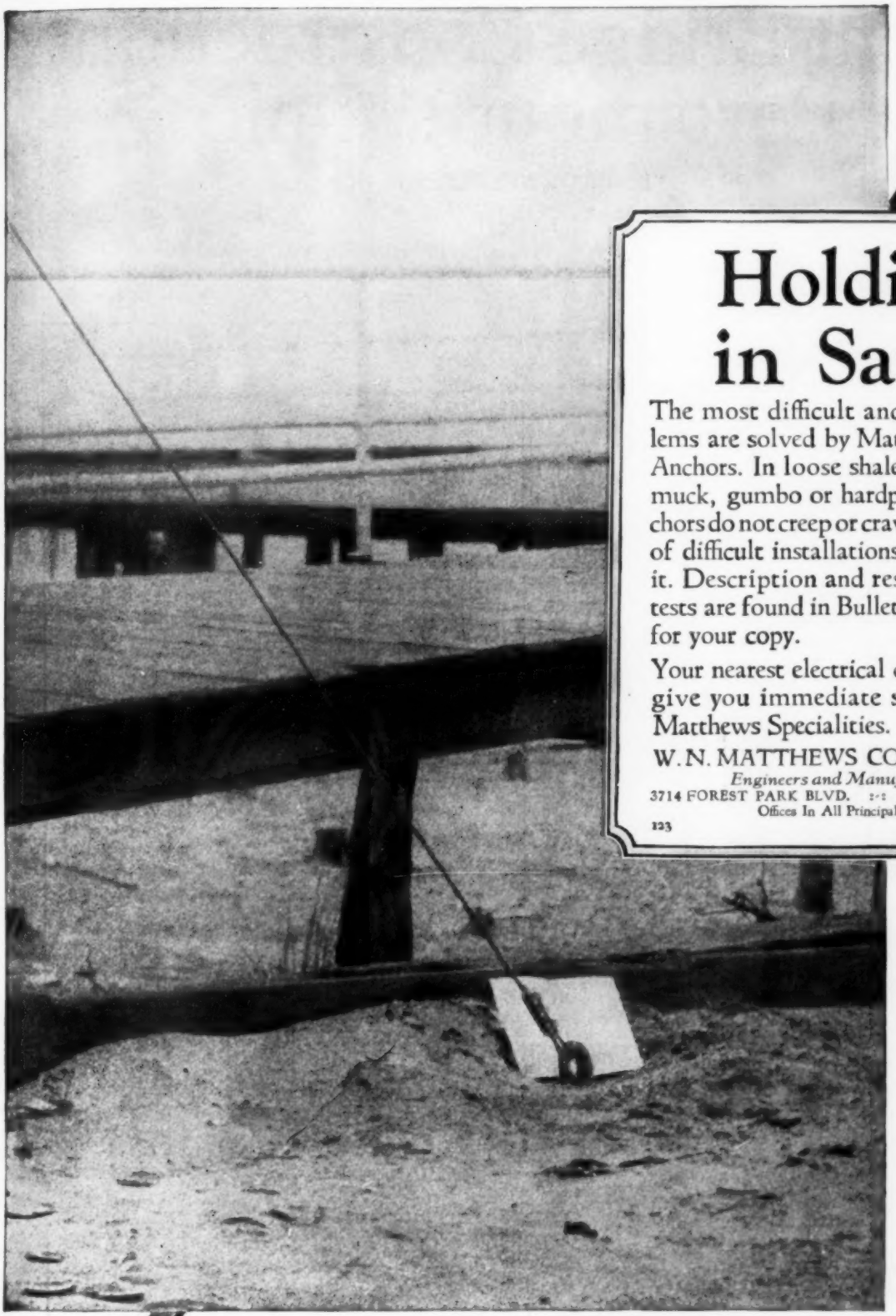

Holding in Sand

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By C. W. KUGELMAN

Plant Superintendent, The Portsmouth (O.) Home Telephone Co.

Those who have had experience with long river spans or crossings can appreciate the feeling of relief one has when said spans have served their usefulness and are no longer a source of worry.

The tower shown in Fig. 1 was erected in 1899 and carried 12 No. 8 steel wires which dead-ended on a stub pole erected about 400 feet north or to the left looking at the cut, on the Portsmouth side of the Ohio river. These wires were originally carried through a fixture or roller arm on the top of a 90-foot cedar pole on a hillside to a head-end pole further up the hill on the Kentucky side of the river. Several years ago this pole was broken, during a storm, and later replaced with the H fixture dead end shown in the September issue of TELEPHONE ENGINEER.

Fig. 1. Bridge at Portsmouth

The wire has been cut, replaced by cable on the new Grant bridge, which was formally dedicated and thrown open to traffic September 22 last.

Grant bridge is of the suspension type, being about 1,700 feet from shore to shore, the main span being 700 feet between towers. Being located in a part of the country subjected to temperatures ranging from zero to 90 degrees, it was necessary to consider the expansion and contraction tendencies of the bridge before permanently placing the cable. This matter was carefully looked into and the strand was placed as will be explained further on.

The main feeder cable to the bridge is all underground, 400-pair, 22-gauge, .10 grounded capacity, double reversed wrapped paper insulated, run to within 300 feet of the bridge box shown in Fig. 2. At the end of the 400, which also feeds territory adjacent to the bridge, is spliced a 50-pair, 19-gauge, cable with other specifications the same as the 400 except lighter sheath. This cable runs through a small manhole, at the base of bridge pier. As the box, a Cook new type 50-pair underground to aerial box, has a factory installed stub the cable was run through the manhole and spliced to the stub on the side of the pier. The splice and all exposed cable was then covered with a Hubbard galvanized cable protector which is clamped to the pier, forming a complete protection from mechanical injury and making the splice easily accessible in case of future changes or trouble.

The aerial cable is spliced to the box stub, as shown in Fig. 2 and carried up and around the pier to the base of the main girder from which is suspended in specially made clamps a three-eighths S. & M. steel strand carrying the cable to the top of the pier shown in Fig. 3. The cable is protected by lead guards around corners of iron and concrete work. As it was necessary to cross to the opposite side of the bridge before crossing the river several short turns had to be made around corners.

Immediately above the point of dead ending the strand, heavy angle iron fence posts are located each side of an expansion plate in the bridge approach. The same type of posts are used on the approach at each end of the bridge; they consist of 2 angle irons, 3 inch by one-quarter inch in dimension, securely bolted together with a half-inch by 3-inch washer between each iron. The posts are 10 feet apart. U bolts were made to fit around these washers to hold a special plate to which is bolted a Hubbard 8903 suspension clamp. One of these clamps is placed on every other post.

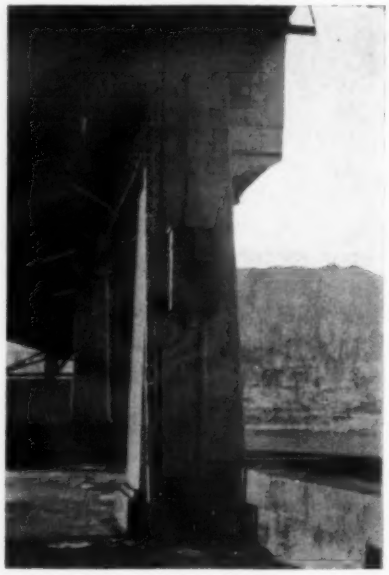


Fig. 2

Fig. 3

As there is much smoke from trains and boats, seven-sixteenths copperweld strand was decided on for the suspension wire. The strand was dead-ended as shown in Fig. 4 on the post toward the bridge proper, eliminating any chance of the expansion joint causing trouble.

As fence posts and uprights carrying the messenger are 10 feet apart, 3 feet of slack was provided in each 100 feet of strand; the strand clamped tightly in place each 100 feet, then placed in special Universal type messenger supports clamped or bolted to upright as shown in Fig. 5, a trifle lower than the top of the fence. The strand is in one piece, the other dead-end being made in the same way at the Kentucky side of the bridge.

As it was not possible to carry the cable underground on the Kentucky side, extra messenger was taken off the bridge at an easy angle and run to a pole where an anchored dead-end was made. This made a very good take-off for the cable.

After the messenger was in place, 2½-inch Blackburn, copperweld, never-slip rings were placed 30 inches apart threaded with a No. 6 pulling-in wire. We were then ready to pull the cable.

As the cable reel could not be placed on the bridge, it was placed on the ground under the bridge, back far enough to

make an easy grade. Leading up strand was equipped with well greased rollers from reel to dead end on bridge. A winch equipped two and a half ton truck was then lined up at the opposite end of the bridge and the pull started.

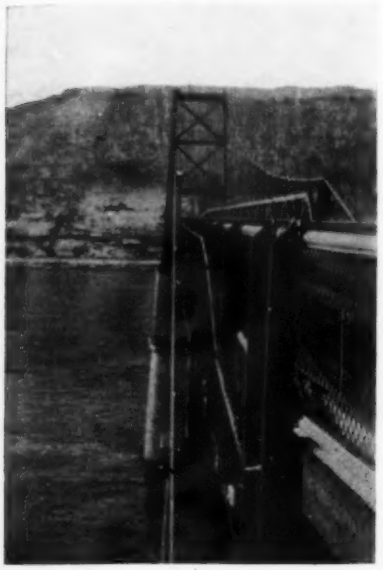


Fig. 4

Seventeen hundred feet is a long pull, but in less than two hours the cable was safely across the bridge, in position to be cut into the terminal. As we wanted no splice on the bridge it was necessary to reel off 150 feet of the cable and work it around and under the bridge to the position at the box shown in Fig. 2.

Splicers were put to work at once, and in a couple of days the old river crossing was a thing of the past.

While the job required quite a bit of special planning, also special clamps and other fittings, we feel amply repaid for our work.

Fig. 6 illustrates the method used to carry cables through a concrete arched bridge over another small river in Portsmouth.

Fig. 5

The main part of this bridge is 160 feet long, and to provide for a small amount of expansion or contraction is entirely independent of the approaches.

At each end of the main span on the approaches in the concrete sidewalk headers, it was necessary to place, paralleling each other, 4 4-inch iron pipes through the forms before the concrete was poured. After the approaches were built, the main span forms were poured, including sidewalk brackets, on top of which there is 11 inches of space to the bottom of the 4-inch sidewalk. In this space and resting on the brackets, 4 3-inch galvanized steel pipes were placed as shown in Fig. 6, and connected with 3-inch fiber conduits, under the sidewalk approaches. They had not, as the cut shows, been connected when the picture was taken.

As the sidewalk approaches are of heavier concrete construction, the pipes are thoroughly imbeded in concrete which prevents any strain from pulling pipes away from conduit; also allows the bridge to slip without buckling the pipes.

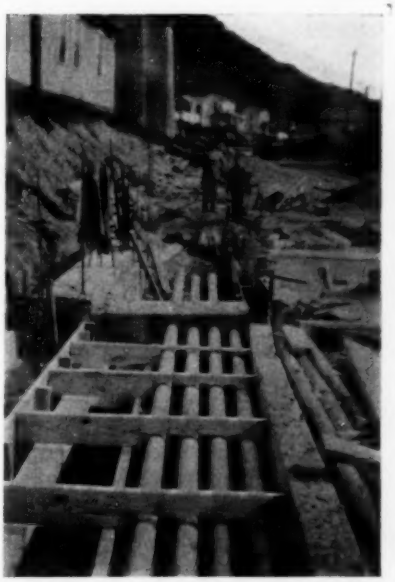


Fig. 6

The cross pieces on the pipe were for bracing the sidewalk bottom form and have since been removed, leaving the pipe clear of the walk and bridge proper, so far as fastenings are concerned.

Manholes are placed about 150 feet from each end of the bridge. Each duct being wired with No. 12 copper wire.

As the bridge was but recently completed, no cables have been drawn in.

Anyone considering cable construction on bridges should not be too hasty in arriving at conclusions. Each type of bridge presents different problems, and unless one has had experience along that line, time alone will show whether or not the proper type of construction has been used.

Unusual Features at Open House Portray Evolution of Telephone

A very distinctive display of "telephone relics" was one of the main features of the "open" house of the Home Telephone & Telegraph Company, Fort Wayne, Ind., which took place January 11 and 12.

The event was a combination one, embracing anniversary week, pioneers' meeting of "old" subscribers. Many subscribers who had had continuous service for more than twenty years were in attendance at the meeting. Many types of phones were on exhibition, which was appreciated by those who are now being served with automatic telephone service in that progressive city.

It is a long cry from the early cumbersome talking boxes to the 1928 models, and the exhibit points out the features of the early ones.

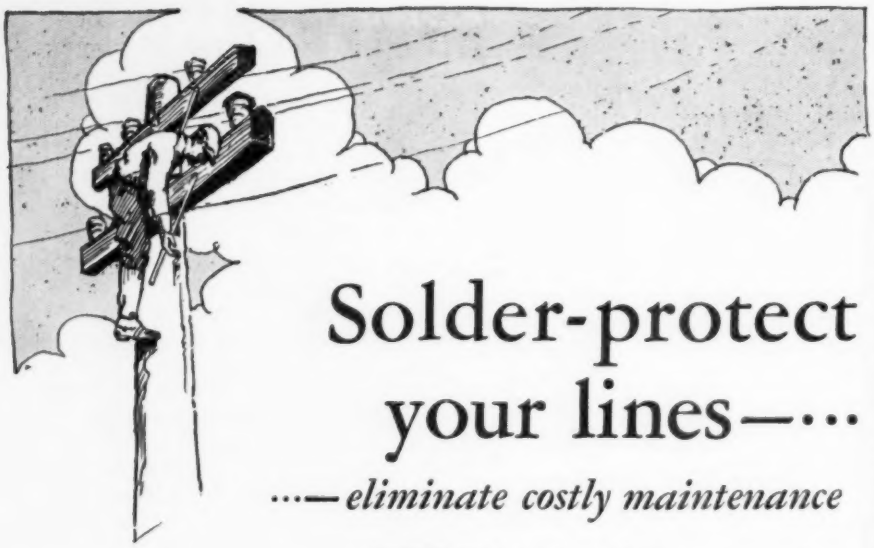
Styles ran from small compact boxes with a moderate sized receiver to a long contraption carrying with it a long narrow receiver. Mouthpieces were placed, apparently according to the particular whim of the inventor, with some at the top of the phone, some at the bottom and many right in the center.

William Hubbard of Elgin, Ill., is the owner of the exhibit and presides over his display, explaining the various parts. There is the early acoustic phone with the large diaphragm, made in 1881. Then there is the first magneto phone, showing another step in the development of the new system.

An interesting reproduction of the first Bell telephone is encased in a glass case, being the property of J. K. Johnson, of Indianapolis. The first electric telephone made by Dr. S. D. Cushman of Racine, Wis., in 1851 in direct opposition to those models made by the American Telephone Company is shown. It is described by Mr. Hubbard as being an electric talking box.

The wire frame used in the cross connecting district as installed originally in Chicago is shown. Mr. Hubbard installed the first system in Chicago, and has assisted in many other parts of the country in the initial plans of the "new fad." Backboards, as first used by the Chicago Bell Company in 1878-81, are included in the historical exhibit.

Mr. Hubbard has had an interesting career in electrical lines. He first became interested in the telegraph in 1864. After working at this vocation for several years he decided to investigate the newer invention, the telephone. In 1875 he took up the work seriously along with his other electrical appliances, namely, electric door bells, electric water motors, return signal call bells and burglar alarms. After working at this favorite hobby for years, and watching the evolution of the telephone, he changed his primary work again in 1921, this time going over to the study of radio, which he is now in.



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Samples upon request

EVERY joint in a telephone system is a potential trouble maker unless it is *solder-protected*. The time spent in finding these high-resistance joints on intermittently open and closed circuits causes the unnecessary expense that cuts too deeply into the net profits.

Line splices and sleeve connections—unprotected by solder are an outstanding example. Mechanical joints, which at the start may prove satisfactory enough, will have but a short life before trouble starts.

Subjected to all outdoor conditions, the splices or sleeves are constantly affected by temperature changes causing expansion and contraction—the joint loosens. Smoke, water and ice get in their share of the damage—swaying with the wind, vibration from numerous sources finally conquer every mechanical joint. Then costly trouble-shooting commences—the offending joint is finally found after perhaps hours and even days and months of hunting. As a means of repair, the joint is promptly "bridged"—and if unprotected by solder there are two sources of further trouble. No wonder telephone officials bemoan the high cost of maintenance—···

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Kester Acid-Core wire solder on each outside connection makes any mechanical joint electrically secure. A splice can be soldered with Kester in less time than it takes to apply sleeves or bridges, and at a fraction of the cost. Kester with its self-fluxing feature cuts ordinary soldering time one-third—it is easy to use. Underwriters Laboratories examined.

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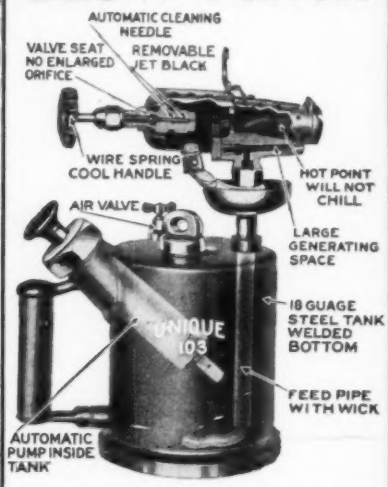

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Healthy Progress Made by British Telephone Services in 1927

During 1927 much work was done by British Post Office engineers and their specialized contractors for the improvement of the United Kingdom's telephone and telegraph services. About 300 miles of duct were laid in roads which were excavated for the purpose to the extent of about 100 miles, and 430 miles of main underground cables were laid, containing 33,000 miles of pairs of conductors for trunk and toll use. For local underground lines about 2,000 miles of duct were laid and cables with a wire mileage of 610,000 drawn in. The value of the contracts placed by the Post Office for the installation of engineering plant was £4,315,000 ($21,575,000), in comparison with £3,210,000 ($16,050,000) in 1926. The value of imported material used, however, was only £1,700 ($8,500).

Five new manual exchanges were opened during the year in the London district to relieve overcrowded existing exchanges, and two new exchanges were provided to replace those already existing at Hatch End and Merstham, while the equipment of 41 exchanges was considerably extended. The number of exchange telephones operating in London rose from 519,969 at the close of 1926 to about 564,600 at the end of 1927—an increase of 8.6 per cent. More than 545,000,000 calls were made by London subscribers to other subscribers in the London area, an increase of about 6.9 per cent on the previous year, and the average number of inland long-distance calls originated daily in London was 16,340—an increase of 11 per cent on the daily totals for 1926.

A new toll exchange, known as Toll A, equipped with 204 operators' positions, was opened during the year, the old toll exchange, now called Toll B, being retained in use for completing traffic coming in to London from the provinces. The opening of the new toll exchange was accompanied by an extension of the toll area to include Aldershot, Canterbury, Chatham, Horsham, Leigh-on-Sea, and Southend-on-Sea with their dependent areas, the control of calls to the toll area at local exchanges outside the five-mile circle, and the control at toll of traffic to exchanges within the London area, but outside the ten-mile circle, from automatic exchanges within the five-mile circle. By the enlargement of the toll area the number of toll circuits associated with the toll exchanges was increased, the total at the end of 1927 being 1,297.

In the United Kingdom 90 new urban exchanges were opened, 36 of them being automatic. Extensions were made to 22 existing exchanges, and 247,000 new subscribers' stations were added to the exchange system throughout the country.

The year 1927 also saw the inauguration of the program for the complete automatic telephoning of London, in preparation for which work has been in progress for four years in providing not only the automatic exchange equipment but also "call indicator" equipment at manual exchanges. The completion of the installation of the latter equipment was essential before the first automatic exchange could be opened, in order to afford intercommunication between subscribers on automatic and on manual exchanges during a transition period which will necessarily extend over several years. The call indicator installations were completed on November 3, and the mechanical tandem exchange—a necessary adjunct to the London automatic system—was also successfully brought into operation.

Holborn, the first automatic exchange in London, having an ultimate capacity of 9,400 lines, or nearly 4,000 more than the old Holborn manual exchange, was opened on November 12. Difficulties were experienced, and expected, many of them being due to faulty operation of the automatic dials by a public not familiar with the new method of working, but there is official confidence that as successive exchanges are brought into operation the "automatic sense" of telephone users generally will develop and result in rapid assimilation of the new conditions and a consequent improvement in the service. It is anticipated that automatic operation will be introduced in seven London exchanges during 1928, and these will be followed in 1929 by 11 more conversions.

The opening of telephone repeater stations at Leeds, Catterick, Newcastle, Jedburgh and Edinburgh completed the chain between London and Edinburgh, and with the associated underground cables provided a link between London and the north of Great Britain independent of weather conditions. A repeater station was also opened at Canterbury to serve the Southeastern district of England and the Continental routes via Belgium and France, and others are approaching completion at Taunton, for the west of England route, and at Halesworth on the route to Norwich.

During the year direct telephonic communication was established with Switzerland and Sweden and, by means of switched circuits, with Denmark and Austria. Commercial speech is now possible between Glasgow and Stockholm, over a telephonic circuit some 2,000 miles in length, thanks to the development of the telephonic repeater and modern submarine cables. A new cable for the telephonic traffic between Britain and France, which it is hoped will be completed early in 1928, is being provided between Hythe and Audrecelles, and will contain 21 circuits.

Transatlantic Phone Service Extended

Transatlantic telephone service from all parts of the United States will be extended to three German cities, Berlin, Hamburg and Frankfort on the Main, on Friday, February 10, at 10 a. m., Chicago time, or as soon thereafter as the other transatlantic traffic will permit.

After the opening day, the hours of operation for service to these German points will be from 6:30 a. m. to 5 p. m., Central Standard time, the same as for British, Belgian and Dutch points. The rate for the three German cities from Chicago and other points in Illinois will be $85.50 for the first three minutes and $28.50 for each additional minute. The report charge for calls failing of completion will be $12.50.

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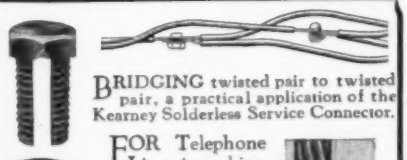

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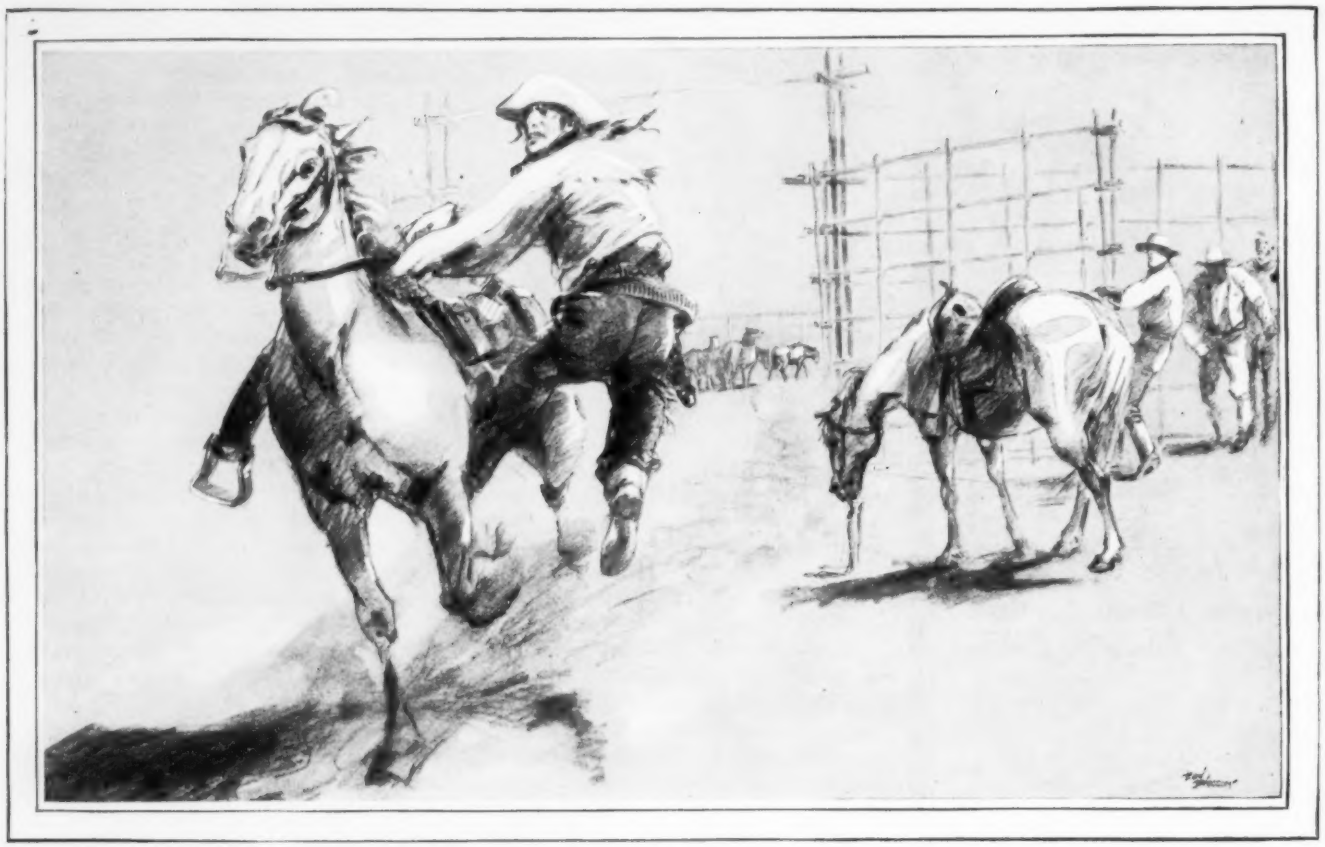

"Get the message through"

An Advertisement of the
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In the Sixties the "pony express" carried the mail over mountains and Indian wildernesses from St. Joseph, Missouri, to San Francisco. The express riders and station keepers won undying fame for getting the message through, regardless of hardship or danger.

Today, in the city of Denver there is rising on the site of one of the old pony express corrals another splendid structure dedicated to the service of modern message-bearing—the new headquarters building of one of the companies of the Bell System. In fact and in spirit, the Bell System is the lineal descendant of the pony express.

It is this spirit of responsibility that causes operators to risk their lives by remaining at their switchboards in the face of fire, flood or other great danger. The same spirit calls linemen or repairmen to go out, even at the risk of their lives, to repair the lines in time of accident or storm.

There are no instructions requiring Bell System employees to endanger their lives. It is the spirit of communication that bids them, "Get the message through."

Arkansas Discusses Commissions at Annual Meet

The Arkansas Telephone Association held its annual convention during January, which proved to be very tame as far as interest was concerned. The only ripple was caused by E. J. Mendel, auditor of the Oklahoma-Arkansas Telephone Company, Poteau, Okla., in which he assailed the Southwestern Bell Telephone Company for what he claimed was unfair toll commissions paid the Independent Companies in Oklahoma, Arkansas and other states by the Southwestern Bell Company.

The discussion by Mr. Mendel elicited some discussion, and he was joined by Mr. E. P. Ladd, president of the association, who felt that the Independents were not receiving fair treatment by the Southwestern Bell. Others who took part in the discussion took the position that the commissions received were fair and equitable. A copy of Mr. Mendel's paper, which was read before the association and which caused the discussion, has been received by TELEPHONE ENGINEER but because of its length cannot be carried at this time.

At the opening session President E. P. Ladd of the Star City Telephone Co., Star City, Ark., delivered a very interesting address covering the activities of the association for the past year.

E. G. Greber, division plant superintendent of the Southwestern Bell Telephone Company, Little Rock, read a paper on "How We Can Improve the Physical Condition of Our Properties to Better Serve the Patrons."

Other interesting subjects were discussed, after which the following officers were elected: E. P. Ladd, Star City, president; S. A. Lane, president of the Southwest Telephone Co., Little Rock, first vice president; E. B. Rhodes, manager, Home Telephone Company, Fordyce, second vice president; Tom Stahl, secretary-treasurer.

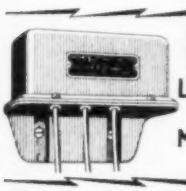
Erroneous

Some people will tell you that 1928 will be an off year, that business will be poor on account of the election of a president.

With me that is all bosh. The year 1924 was one of my best for business, and 1928 has every indication of being a banner year, with contracts signed for appraisal of 65 exchanges in Indiana, Kentucky, Tennessee, Florida, Virginia and Iowa.

As for me, they can elect a president every year.

J. K. JOHNSTON.
Telephone Engineer, 903-4 Lemcke Bldg., Indianapolis, Indiana.



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Same as above but with Kellogg Trans. & Rec. and New Rebuilt cabinet Inside wiring signal set @	10.00
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New York and Tampa Have Direct Circuit

A new direct telephone circuit has been opened between New York and Tampa so that from now on calls will go direct between the two cities instead of being switched through Jacksonville. The circuit is 1,225 miles in length and does not require the aid of any operator at any intervening point. As a result, the service between New York and Tampa will be speeded up and it will also help service between the points in the territories surrounding these two terminals.

In fact, calls from many distant points can now be taken over the same direct New York-Tampa circuit to many places in Florida. Repeater stations are located at Washington, D. C., Richmond, Va., Selma, N. C., Denmark, S. C., and at Jacksonville and Dunnellon, Fla., for the purpose of amplifying the electrical currents set up by the voice.

Shanghai Gets Automatic Telephones

Shanghai's new 5,000 line automatic rotary exchange provides the city with an innovation particularly useful to the communications system of the "Gateway to China," because of the polyglot population. The system was recently installed in the business district of Shanghai and has met instant success. The system was installed in the plant of the Shanghai Mutual Telephone Company which operates the telephone system in the foreign concessions of Shanghai, and was manufactured in the London factory of the Standard Telephones and Cables, Ltd., and the Antwerp plant of the Bell Telephone Manufacturing Company, both of which are associated companies of the International Telephone and Telegraph Corporation, New York. A further 5,000 lines are to be installed in the next stage of the program.

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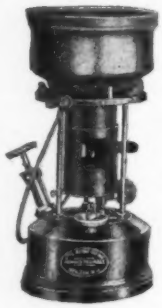

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Carroll and Stephens Head New Ohio Bell Areas

Cleveland, O.—The Ohio Bell Telephone Company on January 1 divided its organization into two operating areas, with a general manager at Cleveland in charge of the northeastern area and another at Columbus in charge of the southwestern area.

The northeastern area comprises the two Cleveland divisions and the Akron division, comprising chiefly the industrial centers around these cities and Canton, Youngstown, Massillon, Ashtabula and Mansfield. The southwestern area is divided into the Columbus, Dayton and Toledo divisions.

J. F. Carroll, Jr., formerly general traffic superintendent of the company, has assumed office as general manager of the northeastern area, with headquarters at Cleveland. F. M. Stephens, formerly general plant superintendent, is general manager of the southwestern area at Columbus. General headquarters remain at Cleveland, where E. F. Carter, president, and Randolph Eide, vice-president, have their offices.

Department heads for the northeastern area are G. A. Kositzky, chief engineer; E. H. Gustafson, general commercial manager; R. P. Bunyan, general plant manager; and J. A. Greene, general traffic manager.

Southwestern area officials are A. F. Wilson, chief engineer; F. R. Eckley, general commercial manager; W. T. Anthony, general plant manager, and Walter Malloy, general traffic manager.

J. F. Carroll

W. G. Barry, formerly general commercial superintendent, has been appointed assistant vice-president, in charge of various activities of statewide application. A. F. Hardman, formerly assistant to the general manager, has become assistant to the vice-president, continuing in general charge of publicity and advertising.

Mr. Eide, in announcing the new plans, said:

"The company's telephones in Ohio now exceed 603,000, about 40,000 of which were added in 1927. The year 1928 indicates continued growth. More than $17,000,000 was expended on additions and betterments in 1927 and it is predicted that 1928 will see a growth of at least 40,000 telephones and gross expenditures to the property of $17,500,000."

F. M. Stephens

There were practically no changes in local officials, and division officials were changed only where necessary to provide for the formation of a new division with headquarters at Dayton. New officials there are Al. L. Jones, division commercial manager; E. H. Pritchard, division traffic superintendent, and J. H. Beilstein, division plant superintendent.

Wm. A. Jackson, Michigan Bell Founder, Dies at New York

New York City.—Wm. A. Jackson, an organizer and first president and general manager of the Michigan Bell Telo. Co., died here at the age of 84. He was employed by the Western Union at Detroit when he first saw the telephone during a visit to the Centennial Exposition, and during that trip he opened negotiations for the Bell Michigan rights. When the company was sold in 1888 he founded the Detroit Electrical Works. In 1895 the American Bell Telo. Co. made Mr. Jackson a director of the Chicago and Iowa telephone companies, the Missouri Bell and a vice-president of the old Central Union. He later became president of the Central Union.

At the request of Harris, Forbes & Co., who organized the Michigan State Telo. Co., he returned to the Michigan presidency, and remained until his retirement in 1913.

Our Literary Digest

The Elements of Telephone Transmission

By H. H. Harrison. With diagrams; 12 mo.; cloth, pp. 147. Price $2.00.

The subject of telephone transmission is one of gradually increasing importance in view of the international telephone circuits continually coming into existence. The present book is not intended as a practical book on the subject, but rather as an introduction to the theoretical side. Moreover, it is designed for the elementary student to whom the present text books form somewhat difficult reading. The relatively simple mathematics of transmission are dealt with at length in a complete chapter. An endeavor has been made to present the phenomena of reflection in a simple, understandable manner.

Several tables of the features of different classes of conductors, their behavior at mean speech frequency, and also over a band of frequencies are inserted in the text at suitable points.

The treatment of the loaded conductor is carried as far as is possible in an elementary book and will enable the student to see the effect of coil spacing on the cut-off frequency.

Telephonic Transmission Theoretical and Applied

By J. G. Hill. With 196 diagrams; 8 vo.; cloth; pp. 398. Price $7.50.

This is one of the very few books which provides a bridge between mathematical theory and its application to everyday problems of the engineer. It is designed to aid the engineer to produce the maximum of efficiency with the minimum of cost. The author gives much credit to the important work done by the American T. and T. Co., and the Western Electric Co.

An Introduction to the Strowger System of Automatic Telephony

By H. H. Harrison. With 161 diagrams; 8 vo.; cloth; pp. 146.

In this book an attempt has been made to deal with the fundamental principles of automatic telephony of the step-by-step type.

While the Strowger system has been chosen for treatment, it is hoped that the book will be useful to the reader about to commence a study of the subject as, with the exception of one system, step-by-step switching methods are employed by all.

Chicago, Ill.—Robert P. Lamont has been elected director of the Illinois Bell Telo. Co. to succeed the late John J. Mitchell.

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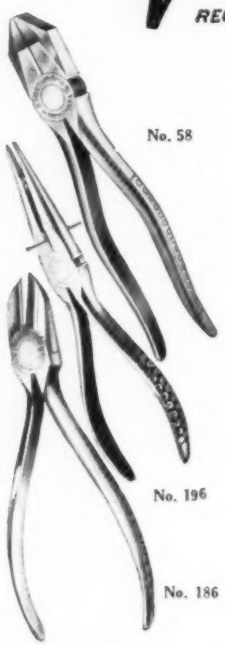

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